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DEPARTMENT OF
SCIENCE & TECHNOLOGY



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

ASSESSMENT OF FIRM-LEVEL INNOVATION IN INDIAN MANUFACTURING

National Manufacturing Innovation Survey 2021-22

United Nations Industrial Development Organization (UNIDO) &
Department of Science & Technology, Government of India

March 2023



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March 2023, New Delhi



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Public Grievances and Pensions;
Minister of State in the Department of Atomic Energy and
Minister of State in the Department of Space
Government of India



MESSAGE

I am pleased to extend my warmest congratulations to the Department of Science and Technology (DST) and the United Nations Industrial Development Organization (UNIDO) on the successful completion of the National Manufacturing Innovation Survey (NMIS) 2021-22. The results of the survey provide significant insight into the state of innovation in India's manufacturing sector. The Government of India has been steadfast in its commitment in promoting the competitiveness of Indian manufacturing and increasing its contribution to the GDP. In the past decade, key policies and programmes have been implemented to stimulate innovation, entrepreneurship and the adoption of new technologies. Additionally, large-scale incentive schemes have been introduced to foster growth and innovation in the manufacturing sector, positioning India as a global manufacturing hub.

The findings of the NMIS 2021-22 can add significant value to the Make in India programme objective, and, the more recent Production Linked Incentive (PLI) scheme. These initiatives aim to enhance manufacturing in various sectors, including electronics, pharmaceuticals, and automobiles, and have already demonstrated positive outcomes. The study's recommendations will undoubtedly strengthen our efforts to address the challenges and opportunities in manufacturing that require immediate attention.

I would once again like to applaud DST and UNIDO for their fruitful collaboration in bringing out NMIS reports and offering recommendations for continued growth and success of the Indian manufacturing sector.

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Secretary
Government of India
Ministry of Science and Technology
Department of Science and Technology



24th March 2023

FOREWORD

I am pleased to present the National Manufacturing Innovation Survey (NMIS) 2021-22 report on behalf of the Department of Science and Technology (DST), Government of India. The significance of this study lies in the government's prioritization of the manufacturing sector as a critical driver of economic growth and job creation in India, and the launch of several initiatives to catalyse innovation across the industry.

NMIS 2021-22, a follow up of first Indian innovation survey in 2011, is a focused effort to evaluate the state of innovation in India's manufacturing sector. In collaboration with the United Nations Industrial Development Organization (UNIDO), this survey provides a comprehensive understanding of the Indian manufacturing innovation landscape.

The NMIS 2021-22 findings offer valuable insights into the enabling characteristics and barriers to innovation faced by firms, and closely evaluated the performance of states and sectors in terms of producing new products and services. The detailed analysis of the survey results provides valuable insights into the innovation ecosystem in India. I anticipate this report to be of great interest to policymakers, researchers, and practitioners in the field of innovation and economic development.

Furthermore, the findings and recommendations of NMIS offer strong insights for strengthening the scope of the 5th National Science, Technology and Innovation Policy (STIP) (draft), to enable a holistic ecosystem for science, technology, and innovation that includes academia, industry, government, and civil society, with a stronger vision for manufacturing innovation to bolster the Make in India agenda.

I am confident that these reports will serve as an essential resource for all those interested in the state of innovation in India, providing valuable information that can contribute to the development of policies and initiatives that can foster a more innovative and dynamic manufacturing sector in the country.

(S. Chandrasekhar)

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Preface by Mr. Ciyong Zou, UNIDO Deputy to the Director General and Managing Director for publication of “the National Manufacturing Innovation Survey 2021-2022”



It is with great pleasure that I introduce the National Manufacturing Innovation Survey (NMIS) 2021-2022 report. Jointly conducted by the Department of Science and Technology (DST) of the Ministry of Science and Technology of India and the United Nations Industrial Development Organization (UNIDO), this report aims at comprehensively assessing the state of manufacturing innovation in India towards the achievement of the 2030 Agenda for Sustainable Development, especially Goal 9, and beyond.

As the only specialized agency of the United Nations mandated to promoting inclusive and sustainable industrial development, UNIDO recognizes the critical role that innovation plays in driving economic growth and job creation in the manufacturing sector. We are proud to partner with the DST in this endeavour to assess the state of innovation in India's manufacturing sector.

The NMIS 2021-2022 is a comprehensive study that provides a detailed understanding of the innovation landscape in India's manufacturing sector through a firm-level and systems analysis of innovation. The firm-level component of the survey examines the performance of firms across states, sectors, and firm sizes in terms of innovation processes, outputs, and barriers, and evaluates the innovation ecosystem that affects the innovation outcomes. The sectorial systems of innovation component provide insights into the collaborative processes between innovation stakeholders in specific industrial sectors, such as automotive, pharmaceutical, textiles, food and beverages, and information and communication technologies (ICT).

The findings of the NMIS 2021-2022 serve as a valuable resource to policymakers, researchers, and practitioners in the field of manufacturing, innovation, and economic development. The report highlights the enabling factors and barriers to innovation in the manufacturing sector and provides valuable insights for strengthening the ecosystem for science, technology, and innovation in India. The recommendations contained in this report will not only contribute to the development of national policies and initiatives but can also guide other countries in the region on ways to foster a more innovative and dynamic manufacturing sector.

I would like to express my sincere appreciation to the DST and the technical advisory committee for their valuable contributions to the NMIS 2021-2022. I also extend my gratitude to all the survey respondents who provided their insights and valuable information for this study serving as a public good. UNIDO is eager to continuing the long-standing collaboration with the Government of India in promoting inclusive and sustainable industrial development.

Ciyong Zou

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डॉ अखिलेश गुप्ता
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PREFACE

The National Manufacturing Innovation Survey (NMIS) 2021-22 is a significant step towards assessing manufacturing innovation in India. The objective of the survey was to evaluate the performance of states, sectors, and firm sizes in terms of innovation processes, outcomes, and barriers, as well as the innovation ecosystem that affects innovation outcomes. The NMIS 2021-22 offers a comprehensive understanding of manufacturing innovation in India from all perspectives.

The Department of Science and Technology (DST), in collaboration with the United Nations Industrial Development Organization (UNIDO), has developed the first Indian Manufacturing Innovation Index (IMII) for guiding decision-making in innovation policy with respect to manufacturing and related services. The significant difference in the IMII score captures the variations in manufacturing across the states.

The “Assessment of Firm-Level Innovation in Indian Manufacturing” report provides a comprehensive and in-depth analysis of innovation activities, outcomes, and barriers in manufacturing firms. Additionally, the NMIS 2021-22 survey produced five reports studying the sectorial systems of innovation within manufacturing sectors, namely, Automotive, Pharmaceutical, Textiles, Food & Beverages, and Information & Communication Technologies (ICT). These reports examine the collaborative processes between innovation stakeholders and the innovation systems available to specific industrial sectors.

The key findings from the study demonstrate that innovation is highly beneficial to manufacturing firms. Over a quarter of manufacturing firms in the country are innovative, and about eighty percent of these firms have used innovations successfully to increase turnover, open new market opportunities, and respond to market and cost pressures. However, the study also reveals that firms face a wide array of barriers to innovation, and innovation activities require perseverance and long-term commitment. Manufacturing firms demonstrate high risk-aversion and lack of entrepreneurial appetite to engage with innovation. Instead of competing for new products that are necessary to compete in the future, firms are still addressing the predominant and immediate demands in the market. These findings call for concerted efforts in strengthening manufacturing policies and bring attention to the need for an innovation strategy for the country, with particular attention to manufacturing.

I would like to express my sincere appreciation to all those who contributed to the creation of this report, including the UNIDO team and the technical advisory committee from DST. We sincerely hope that this report will be of great value as valuable resource and reference note.

(Akhilesh Gupta)

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Acronyms

AI	Artificial Intelligence
ASI	Annual Survey of Industries
BPI	Business Process Innovations
BRICS	Brazil, Russia, India, China and South Africa
CMIE	Centre for Monitoring Indian Economy
CSR	Corporate Social Responsibility
CTIER	Centre for Technology, Innovation and Economic Research
DNH&DD	Dadra & Nagar Haveli and Daman & Diu
DPIIT	Department for Promotion of Industry and Internal Trade
DRDO	Defence Research and Development Organisation
DST	Department of Science and Technology
EoDB	Ease of Doing Business
ERP	Enterprise Resource Planning
EU	European Union
FAPCCI	Federation of Andhra Pradesh Chambers of Commerce and Industry
FDI	Foreign Direct Investment
FTCCI	Federation of Telangana Chambers of Commerce and Industry
GCC	Global Capability Centers
GDP	Gross Domestic Product
GERD	Gross Expenditure on Research and Development
GII	Global Innovation Index
GoI	Government of India
GSDP	Gross State Domestic Product
GVA	Gross Value Added
ICT	Information and Communication Technology
ICTSD	International Centre on Trade and Sustainable Development
II	India Innovation Index
IIM	Indian Institute of Management
IISc	Indian Institute of Science
IIT	Indian Institute of Technology
IMI	India Manufacturing Innovation Index
INR	Indian Rupees
IoT	Internet of Things
IPR	Intellectual Property Right

ISID	Institute for Studies in Industrial Development
IT	Information Technology
KBC	Knowledge Based Capital
KMO	Kaiser-Meyer-Olkin
LPI	Logistics Performance Index
MCCI	Madras Chamber of Commerce and Industries
ML	Machine Learning
MoSPI	Ministry of Statistics and Programme Implementation
MNC	Multi National Company
MSME	Ministry of Small and Micro Enterprises
NER	North Eastern Region
NIC	National Industrial Classification
NIS	National Innovation System
NITI	National Institution for Transforming India
NTM	New to Market
OECD	Organization for Economic Cooperation and Development
PCT	Patent Cooperation Treaty
PHDCCI	Punjab, Haryana and Delhi Chamber of Commerce and Industry
PI	Product Innovation
PIB	Press Information Bureau
PLI	Production Linked Incentive
PPP	Purchasing Power Parity
PRC	People's Republic of China
R&D	Research and Development
RBI	Reserve Bank of India
SME	Small and Micro Enterprises
SSI	Sectorial System of Innovation
STEM	Science, Technology, Engineering and Mathematics
STIP	Science Technology & Innovation Policy
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
USD	United States Dollar
UT	Union Territory
VC	Venture Capital
WIPO	World Intellectual Property Organization

Glossary

Artificial intelligence (AI): Artificial intelligence (AI) describes the activity and outcome of developing computer systems that mimic human thought processes, reasoning, and behaviour.

Asset: An asset is a store of value that represents a benefit or series of benefits accruing to the economic owner by holding or using the asset over a period of time. Both financial and non-financial assets are relevant to innovation. Fixed assets are the result of production activities and are used repeatedly or continuously in production processes for more than one year.

Business capabilities: Business capabilities include the knowledge, competencies, and resources that a firm accumulates over time and draws upon in the pursuit of its objectives. The skills and abilities of a firm's workforce are a particularly critical part of innovation-relevant business capabilities.

Business process innovation: A business process innovation is a new or improved business process for one or more business functions that differs significantly from the firm's previous business processes and that has been brought into use by the firm. The characteristics of an improved business function include greater efficacy, resource efficiency, reliability and resilience, affordability, and convenience and usability for those involved in the business process, either external or internal to the firm. Business process innovations are implemented when they are brought into use by the firm in its internal or outward-facing operations. Business process innovations include the following functional categories:

- Production of goods and services.
- Distribution and logistics.
- Marketing and sales.
- Information and communication systems.
- Administration and management.
- Product and business process development.

Composite indicator: A composite indicator compiles multiple indicators into a single index based on an underlying conceptual model in a manner which reflects the dimensions or structure of the phenomena being measured.

Co-operation: Co-operation occurs when two or more participants agree to take responsibility for a task or series of tasks and information is shared between the parties to facilitate the agreement.

Digitalisation: Digitalisation is the application or increase in use of digital technologies by an organisation, industry, country, etc. It refers to how digitisation affects the economy or society.

Employee training activities: Employee training includes all activities that are paid for or subsidised by the firm to develop knowledge and skills required for the specific trade, occupation, or vocation of a firm's employees. Employee training includes on-the-job training and job-related education at training and educational institutions. Examples of training as an innovation activity include training personnel to use innovations, such as new software logistical systems or new equipment; and training relevant to the implementation of an innovation, such as instructing marketing personnel or customers on the features of a product innovation.

Engineering, design, and other creative work

activities: Engineering, design and other creative work cover experimental and creative activities that may be closely related to research and experimental development (R&D), but do not meet all of the five R&D criteria. These include follow-up or auxiliary activities of R&D, or activities that are performed independently from R&D. Engineering involves production and quality control procedures, methods, and standards. Design includes a wide range of activities to develop a new or modified function, form or appearance for goods, services, or processes, including business processes to be used by the firm itself. Other creative work includes all activities for gaining new knowledge or applying knowledge in a novel way that do not meet the specific novelty and uncertainty (also relating to non-obviousness) requirements for R&D. Most design and other creative work are innovation activities, with the exception of minor design changes that do not meet the requirements for an innovation. Many engineering activities are not innovation activities, such as day-to-day production and quality control procedures for existing processes.

Firm: Informal term used in this manual to refer to business enterprises.

Global value chains: Pattern of organisation of production involving international trade and investment flows whereby the different stages of the production process are located across different countries.

Indicator: An indicator is a variable that purports to represent the performance of different units along some dimension. Its value is generated through a process that simplifies raw data about

complex phenomena in order to compare similar units of analysis across time or location.

Industry: An industry consists of a group of establishments engaged in the same, or similar, kinds of activity.

Innovation: An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).

Innovation-active firm: An innovation-active firm is engaged at some time during the observation period in one or more activities to develop or implement new or improved products or business processes for an intended use. Both innovative and non-innovative firms can be innovation-active during an observation period.

Innovation activities: Institutional units can undertake a series of actions with the intention to develop innovations. This can require dedicated resources and engagement in specific activities, including policies, processes, and procedures.

Innovation activities (business): Business innovation activities include all developmental, financial, and commercial activities undertaken by a firm that are intended to result in an innovation for the firm. They include:

- Research and experimental development (R&D) activities.
- Engineering, design, and other creative work activities.
- Marketing and brand equity activities.
- Intellectual property (IP) related activities.

- Employee training activities.
- Software development and database activities.
- Activities related to the acquisition or lease of tangible assets.
- Innovation management activities.

Innovation activities can result in an innovation, be ongoing, postponed or abandoned.

Innovation barriers and drivers: Internal or external factors that hamper or incentivise business innovation efforts. Depending on the context, an external factor can act as a driver of innovation or as a barrier to innovation.

Innovation indicator: An innovation indicator is a statistical summary measure of an innovation phenomenon (activity, output, expenditure, etc.) observed in a population or a sample thereof for a specified time or place. Indicators are usually corrected (or standardised) to permit comparisons across units that differ in size or other characteristics.

Innovation management: Innovation management includes all systematic activities to plan, govern and control internal and external resources for innovation. This includes how resources for innovation are allocated, the organisation of responsibilities and decision-making among employees, the management of collaboration with external partners, the integration of external inputs into a firm's innovation activities, and activities to monitor the results of innovation and to support learning from experience.

Innovation objectives: Innovation objectives consist of a firm's identifiable goals that reflect its motives and underlying strategies with respect to its innovation efforts. The objectives can concern the characteristics of the innovation

itself, such as its specifications, or its market and economic objectives.

Innovation outcomes: Innovation outcomes are the observed effects of innovations, including the extent to which a firm's objectives are met and the broader effects of innovation on other organisations, the economy, society, and the environment. These can also include unexpected effects that were not identified among the firm's initial objectives (e.g. spill overs and other externalities).

Innovative firm: An innovative firm reports one or more innovations within the observation period. This applies equally to a firm that is individually or jointly responsible for an innovation. The term "innovative" is only used in the manual in this context.

Intellectual property (IP) related activities: Intellectual property (IP) related activities include the protection or exploitation of knowledge, often created through research and experimental development (R&D), software development, and engineering, design and other creative work. IP activities include all administrative and legal work to apply for, register, document, manage, trade, license-out, market and enforce a firm's own intellectual property rights (IPRs), all activities to acquire IPRs from other organisations such as through licensing-in or the outright purchase of IP, and activities to sell IP to third parties. IP activities for ideas, inventions and new or improved products or business processes developed during the observation period are innovation activities.

Knowledge-based capital (KBC): Knowledge-based capital (KBC) comprises intangible assets that create future benefits. It comprises software and databases, Intellectual property

products, and economic competencies (including brand equity, firm-specific human capital, organisational capital). Software, databases, and intellectual property products are currently recognised by the System of National Accounts as produced assets.

Knowledge flows: Knowledge flows refer to inbound and outbound exchanges of knowledge, through market transactions as well as non-market means. Knowledge flows encompass both deliberate and accidental transmission of knowledge.

Managerial capabilities: Managerial capabilities include all of a firm's internal abilities, capacities, and competences that can be used to mobilise, command and exploit resources in order to meet the firm's strategic goals. These capabilities typically relate to managing people; intangible, physical, and financial capital; and knowledge. Capabilities concern both internal processes and external relations. Managerial capabilities are a specific subset of organisational capabilities that relate to the ability of managers to organise change.

Marketing and brand equity activities: Marketing and brand equity activities include market research and market testing, methods for pricing, product placement and product promotion; product advertising, the promotion of products at trade fairs or exhibitions and the development of marketing strategies. Marketing activities for existing products are only innovation activities if the marketing practice is itself an innovation.

Marketing innovation: Type of innovations used in the previous edition of this Manual, currently these are mostly subsumed under business process innovation, except for innovations in

product design which are included under product innovation.

New-to-firm (NTF) innovation: Lowest threshold for innovation in terms of novelty referring to a first time use or implementation by a firm. A new-to-firm (NTF) innovation can also be new-to-market (NTM) (or world), but not vice versa. If an innovation is NTF but not NTM (e.g. when adopting existing products or business processes – as long as they differ significantly from what the firm offered or used previously – with little or no modification), it is referred to as “NTF only”.

New-to-market (NTM) innovation: An innovation by a firm that has not been available in the market(s) served by the firm. New-to-market innovation represent a higher threshold for innovation than a new-to-firm innovation in terms of novelty.

Non-innovative firm: A non-innovative firm is one that does not report an innovation within the observation period. A non-innovative firm can still be innovation-active if it had one or more ongoing, suspended, abandoned or completed innovation activities that did not result in an innovation during the observation period.

Novelty: Novelty is a dimension used to assess whether a product or business process is “significantly different” from previous ones and if so, it could be considered an innovation. The first and most widely used approach to determine the novelty of a firm's innovations is to compare these with the state of the art in the market or industry in which the firm operates. The second option is to assess the potential for an innovation to transform (or create) a market, which can provide a possible indicator for the

incidence of radical or disruptive innovation. A final option for product innovations is to measure the observed change in sales over the observation period or by asking directly about future expectations of the effect of these innovations on competitiveness.

Observation period: The observation period is the length of time covered by a question in a survey.

Open innovation: Open innovation denotes the flow of innovation-relevant knowledge across the boundaries of individual organisations. This notion of “openness” does not necessarily imply that knowledge is free of charge or exempt from use restrictions.

Organisational innovation: Type of innovation used in the previous edition of this Manual, currently subsumed under business process innovation.

Product innovation: A product innovation is a new or improved good or service that differs significantly from the firm’s previous goods or services and that has been introduced on the market. Product innovations must provide significant improvements to one or more characteristics or performance specifications.

Reference period: The reference period is the final year of the overall survey observation period and is used as the effective observation period for collecting interval level data items, such as expenditures or the number of employed persons.

Software development and database activities: Software development and database activities include:

- The in-house development and purchase of computer software, programme descriptions

and supporting materials for both systems and applications software (including standard software packages, customised software solutions and software embedded in products or equipment).

- The acquisition, in-house development and analysis of computer databases and other computerised information, including the collection and analysis of data in proprietary computer databases and data obtained from publicly available reports or the Internet.
- Activities to upgrade or expand the functions of information technology systems, including computer programmes and databases. This includes statistical data analysis and data mining activities.

Software development is an innovation activity when used to develop new or improved business processes or products, such as computer games, logistical systems, or software to integrate business processes. Database activities are an innovation activity when used for innovation, such as analyses of data on the properties of materials or customer preferences.

Stratified sample: A stratified sample is a sample selected from a population which has been divided into separate groups (“strata”) to control the representation of key sub-populations. Separate samples are drawn from each stratum and the target sample size for each will depend on precision criteria, as well as on the number of units, the size of the units and the variability of the main variables of interest within each stratum.

Survey frame: The frame population is the set of target population members that has a chance to be selected into the survey sample.

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EXECUTIVE SUMMARY

The National Manufacturing Innovation Survey (NMIS) 2021-22 was conducted by the United Nations Industrial Development Organization (UNIDO) in collaboration with the Department of Science and Technology (DST), Government of India, from February 2021 to May 2022. A stratified random sampling across state, sector and firm sizes was done to survey a sample of

10,139 firms covering 28 states and 6 UTs (excluding Lakshadweep). The sampling frame from the 2017-18 Annual Survey of Industries (ASI) database, the Centre of Monitoring Indian Economy's (CMIE) Prowess IQ database and DST's database of manufacturing and related services firms (59 sectors as per the 2008 National Industrial Classification) were used.

Data was collected for the observation period from the financial year 2017-18 to 2019-20. The data collection between February 2021 and May 2022 was impacted by the COVID pandemic due to the closure of many businesses in the country. Amidst the pandemic, the survey was conducted fully online, resulting in a response rate of 80% (8,087 firms out of 10,139).

Indian Manufacturing Innovation Index (IMII) 2022 was constructed from the results of the NMIS 2021-22 to compare the performance of 28 states and 6 union territories¹ across three dimensions, 9 pillars and 80 indicators. From the 59 NIC sectors, 54 manufacturing sub-sectors² were selected and clubbed into 33 sector groups, out of which 17 sector groups with at least 100 responses were used for sector-wise analysis across all variables. Analysis by firm size was conducted for large, medium, small, and micro firms (based on turnover and investment in plant and machinery or equipment) across all variables.

The following sections provide an overview of the results of IMII 2022 and some key takeaways from the overall analysis by state, sector, and firm sizes. Firstly, states and UTs are ranked by the Indian Manufacturing Innovation Index (IMII) scores by region, income group (GSDP per capita 2019-20) and the IMII state categorisation (major states, hill states and UT and city states) in Table 1. In addition, best, average, and low performers are identified across states and UTs for the overall IMII score and the Enablers, Barriers (absence) and Performance dimension scores in Table 2 while grouped as per the IMII state categorisation. Secondly, the top three innovators in Indian manufacturing by region³ (Figure 1) and by income group (GSDP per capita 2019-20) (Table 3) are identified. Thirdly, the manufacturing innovation performance by IMII state categorisation and income group is depicted in Table 4 and Table 5, respectively. Finally, a brief overview of the key results of the Indian Manufacturing Innovation Index 2022 is provided.

A. INDIAN MANUFACTURING INNOVATION INDEX (IMII) RANKINGS 2022

Table 1 presents the IMII overall rank across 28 states and 6 union territories, their respective IMII scores, zone-wise rank, income group (GSDP per capita 2019-20) rank and IMII category rank.

For the purpose of analysis, states and UTs are grouped into three categories, namely Major states, Hill states and UT & City states and their ranking is presented as IMII Category rank.

¹ The UT of Andaman and Nicobar Islands and the UT of Ladakh were excluded from the analysis owing to low number of responses (12 and 1, respectively).

² Mining support service activities (09) and food and beverage service activities (56) were excluded from the analysis owing to low presence in the population. Extraction of crude petroleum and natural gas (06), water transport (50) and postal and courier services (53) were excluded from the analysis owing to zero response. See Annexure Table.

³ North, East, South and West zones

TABLE 1: Indian Manufacturing Innovation Index (IMII) Rankings 2022

IMII OVERALL RANK	STATES	IMII SCORE	ZONE-WISE RANK (REGION RANK)	GSDP PER CAPITA RANK (INCOME RANK)	IMII CATEGORY RANK ⁴
1	KARNATAKA	33.41	1	1	1
2	DADRA & NAGAR HAVELI & DAMAN & DIU	32.88	1	N/A ⁵	1
3	TELANGANA	32.86	2	2	2
4	TAMIL NADU	32.54	3	3	3
5	UTTARAKHAND	31.72	1	4	1
6	MAHARASHTRA	31.38	2	4	4
7	PUDUCHERRY	31.29	4	6	2
8	HIMACHAL PRADESH	31.20	2	7	2
9	NEW DELHI	30.55	3	1	3
10	HARYANA	30.47	4	8	5
11	GUJARAT	30.37	3	9	6
12	GOA	29.77	4	2	4
13	KERALA	29.39	5	10	7
14	UTTAR PRADESH	29.00	5	1	8
15	MADHYA PRADESH	28.47	5	2	9
16	WEST BENGAL	27.77	1	1	10
17	PUNJAB	27.48	6	2	11
18	CHANDIGARH	27.03	7	3	5
19	CHHATTISGARH	27.02	2	3	12
20	RAJASTHAN	26.42	6	4	13
21	JAMMU & KASHMIR	26.29	8	5	3
22	ANDHRA PRADESH	24.25	6	6	14
23	ODISHA	23.05	3	7	15
24	JHARKHAND	22.78	4	3	16
25	ASSAM	22.22	5	4	17
26	BIHAR	21.32	6	5	18
27	NORTH-EASTERN STATES (EXCL. ASSAM)	19.69	7	6	4

Zones ⁶	
	East Zone
	West Zone
	South Zone
	North Zone

GSDP Per Capita Income Groups	
	Below ₹ 1,00,000
	₹ 1,00,000 - ₹ 2,00,000
	₹ 2,00,000 - ₹ 3,00,000
	Above ₹ 3,00,000

IMII State Groups	
	Major States
	Hill States
	UT & City States

⁴ See categorisation of states into major states, hill states and UT and city states.

⁵ GSDP per capita of DNH & DD is not available.

⁶ Annexure 1.pdf (dcmsme.gov.in)

Table 2 shows the IMII overall rank, IMII score, Enablers (presence) score, Barriers (absence) score and Performance score across 28 states & 6 UTs.

TABLE 2: Enablers, Barriers & Performance

STATES	IMII RANKING	IMII SCORE	ENABLERS (PRESENCE) SCORE	BARRIERS (ABSENCE) SCORE	PERFORMANCE SCORE
MAJOR STATES					
KARNATAKA	1	33.41	27.28	40.07	32.87
TELANGANA	3	32.86	28.17	37.57	32.83
TAMIL NADU	4	32.54	24.37	44.16	29.07
MAHARASHTRA	6	31.38	26.07	37.79	30.27
HARYANA	10	30.47	22.92	40.84	27.63
GUJARAT	11	30.37	25.50	38.18	27.43
KERALA	13	29.39	21.43	41.74	25.01
UTTAR PRADESH	14	29.00	18.37	43.28	25.36
MADHYA PRADESH	15	28.47	20.03	40.55	24.82
WEST BENGAL	16	27.77	17.06	39.03	27.23
PUNJAB	17	27.48	16.95	40.69	24.81
CHHATTISGARH	19	27.02	18.39	39.55	23.12
RAJASTHAN	20	26.42	19.78	35.57	23.92
ANDHRA PRADESH	22	24.25	16.92	35.35	20.48
ODISHA	23	23.05	12.88	34.63	21.63
JHARKHAND	24	22.78	14.53	30.93	22.86
BIHAR	26	21.32	12.47	34.40	17.10
MAJOR STATES AVERAGE		28.12	20.18	38.49	25.67
HILL STATES					
UTTARAKHAND	5	31.72	22.93	43.23	28.99
HIMACHAL PRADESH	8	31.20	22.77	43.27	27.55
ASSAM	25	22.22	16.64	27.82	22.18
NORTH-EASTERN STATES (EXC. ASSAM)	27	19.69	13.00	25.42	20.65
HILL STATES AVERAGE		26.21	18.84	34.94	24.84
UT & CITY STATES					
DADRA & NAGAR HAVELI & DAMAN & DIU	2	32.88	28.69	39.92	30.03
PUDUCHERRY	7	31.29	19.68	50.83	23.35
NEW DELHI	9	30.55	24.08	40.27	27.31
GOA	12	29.77	25.33	38.05	25.94
CHANDIGARH	18	27.03	22.09	32.16	26.84
JAMMU & KASHMIR	21	26.29	15.76	38.96	24.16
UT & CITY STATES AVERAGE		29.64	22.61	40.03	26.27
NATIONAL AVERAGE		28.17	20.52	38.31	25.68

Best Performers Above national average + standard deviation	Average Performers Between national average + standard deviation and national average - standard deviation	Low Performers Below national average - standard deviation
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The state innovation performance is assessed based on the national average & standard deviation of the IMII score, Enablers (presence) score, Barriers (absence) score and Performance score. States or UTs with innovation scores greater than the national average *plus* standard deviation are best performers (highest share of firms across respective indicators). States or UTs with innovation scores between the national average *plus* standard deviation and national average *minus* standard deviation are average performers (moderate share of firms across respective indicators). States or UTs with innovation scores less than the national average *minus* standard deviation are low performers (least share of firms across respective indicators).

The state of Karnataka (33.41) ranked highest on IMII 2022 and the lowest was in North-eastern states (excluding Assam) (19.69). The range of the IMII 2022 scores is 13.72, representing significant differences at indicator level performance across 80 indicators.

- Karnataka is closely followed by Dadra & Nagar Haveli and Daman & Diu (32.88), Telangana (32.86), and Tamil Nadu (32.54).
- Low-scoring states are North-eastern states (excluding Assam) (19.69) followed by Bihar (21.32), Assam (22.22), Jharkhand (22.78), Odisha (23.05) and Andhra Pradesh (24.25).
- All other states and UTs have scored average IMII scores.

B. TOP INNOVATORS IN INDIAN MANUFACTURING

Indian Manufacturing Innovation Index (IMII) 2022 measures innovation in manufacturing and related services through the dimensions of enablers (presence), barriers (absence) and performance. Enablers consist of 3 pillars, namely Innovation activity and investment, Innovation capabilities and Innovation linkages and knowledge flows that provide a conducive environment for firms to innovate. Barriers (absence)⁷ measure the challenges related to financing, policy, Potential and capability and market and linkages on innovation input activities. Performance measures innovation incidence (product or business process innovations) and characteristics (novelty, in-house innovation), and innovation objectives and outcomes.

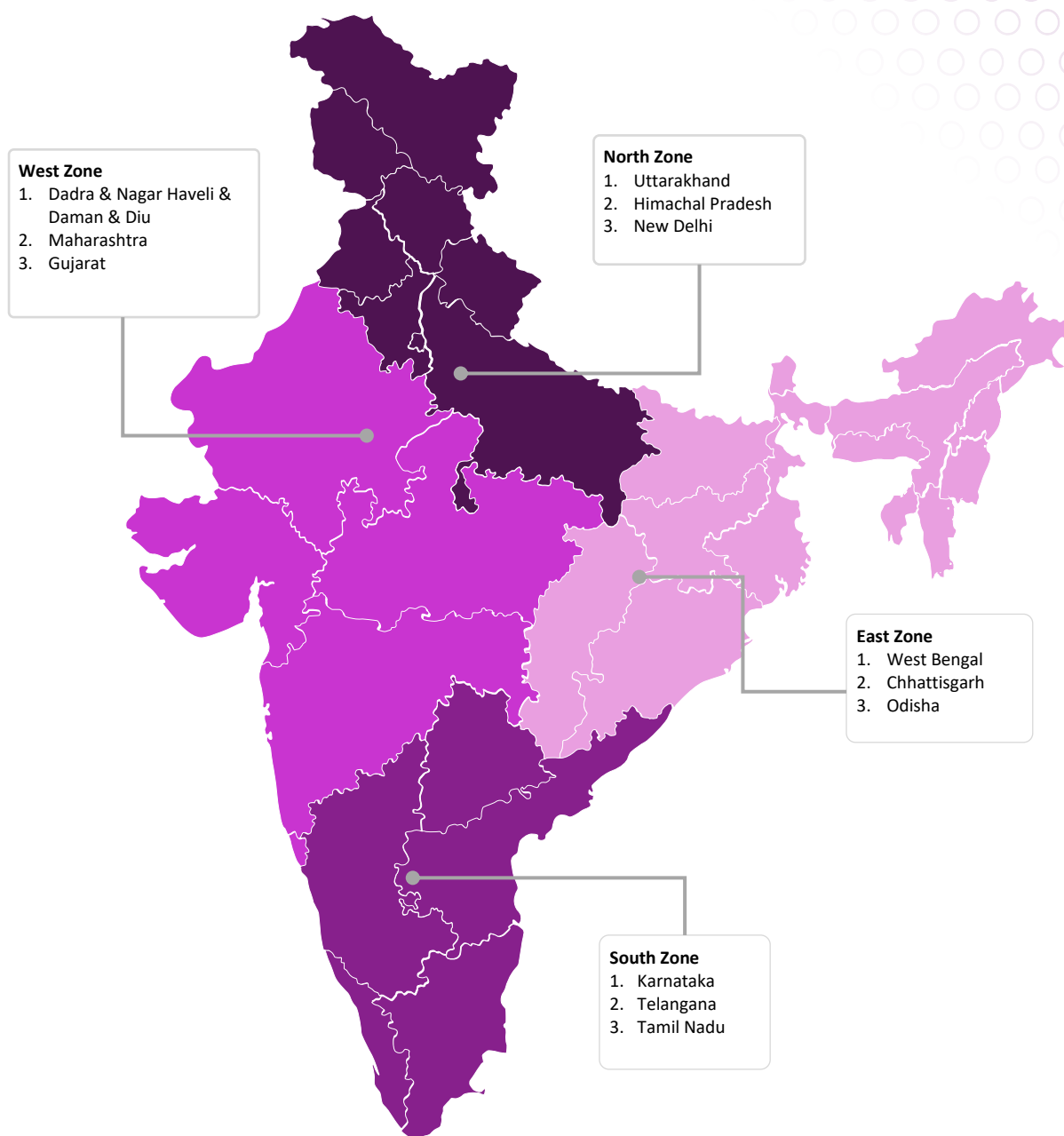
Figure 1 depicts top 3 innovators by region⁸. The North Zone has 8 states or UTs, out of which the top 3 innovators are Uttarakhand, Himachal Pradesh & New Delhi. The West Zone has 6 states or UTs, out of which the top 3 innovators are Dadra & Nagar Haveli and Daman & Diu, Maharashtra and Gujarat. The South Zone has 5 states or UTs, out of which the top 3 innovators are Karnataka, Telangana and Tamil Nadu. The East Zone has 13 states⁹, out of which the top 3 innovators are West Bengal, Chhattisgarh and Odisha

⁷ For the index construction, barrier indicators have been transformed such that impact of all indicators on the index is positive. Hence, indicators in the 'Barrier' dimension depicts the absence of barriers while innovating.

⁸ North, East, South and West zones

⁹ 7 North-eastern states, namely Sikkim, Nagaland, Manipur, Mizoram, Meghalaya, Arunachal Pradesh, and Tripura were clubbed due to low response rate.

FIGURE 1: Top innovators in Indian manufacturing by region



Zones	East Zone	West Zone	South Zone	North Zone

Table 3 highlights the top 3 innovators by income group (GSDP per capita 2019-20). In the below INR 1,00,000 category, Uttar Pradesh is the top innovator whereas in the INR 1,00,000 - 2,00,000

category, West Bengal has the highest innovation score. In the INR 2,00,000 - 3,00,000 category, Karnataka is the top innovator, while New Delhi tops the above INR 3,00,000 category.

TABLE 3: Top innovators in Indian manufacturing by income group

Above INR 3,00,000	Innovation Score	INR 2,00,000 - 3,00,000	Innovation Score	INR 1,00,000 - 2,00,000	Innovation Score	Below INR 1,00,000	Innovation Score
NEW DELHI	30.55	KARNATAKA	33.41	WEST BENGAL	27.77	UTTAR PRADESH	29.00
GOA	29.77	TELANGANA	32.86	PUNJAB	27.48	MADHYA PRADESH	28.47
CHANDIGARH	27.03	TAMIL NADU	32.54	CHHATTISGARH	27.02	JHARKHAND	22.78
		UTTARAKHAND	31.72	RAJASTHAN	26.42	ASSAM	22.22
		MAHARASHTRA	31.38	JAMMU & KASHMIR	26.29	BIHAR	21.32
		PUDUCHERRY	31.29	ANDHRA PRADESH	24.25	NER STATES (EXCL. ASSAM)	19.69
		HIMACHAL PRADESH	31.20	ODISHA	23.05		
		HARYANA	30.47				
		GUJARAT	30.37				
		KERALA	29.39				

C. MANUFACTURING INNOVATION PERFORMANCE

Table 4 depicts manufacturing innovation performance by state category, namely major states, hill states and UT & city states. The states or UTs with innovation scores greater than the category average *plus* standard deviation are best performers (highest share of firms across respective indicators). States or UTs with innovation scores between the category average

plus standard deviation and category average *minus* standard deviation are average performers (moderate share of firms across respective indicators). States or UTs with innovation scores less than the category average *minus* standard deviation are low performers (least share of firms across respective indicators).

TABLE 4: Manufacturing innovation performance by category of states

	Major States	UT and City States	Hill States
Performance above expectation	<ul style="list-style-type: none"> » Karnataka » Telangana » Tamil Nadu 	<ul style="list-style-type: none"> » Dadra & Nagar Haveli & Daman & Diu 	
Performance in line with expectation	<ul style="list-style-type: none"> » Maharashtra » Haryana » Gujarat » Kerala » Uttar Pradesh » Madhya Pradesh » West Bengal » Punjab » Chhattisgarh » Rajasthan » Andhra Pradesh 	<ul style="list-style-type: none"> » Puducherry » New Delhi » Goa 	<ul style="list-style-type: none"> » Uttarakhand » Himachal Pradesh » Jammu & Kashmir
Performance below expectation	<ul style="list-style-type: none"> » Odisha » Jharkhand » Assam » Bihar 	<ul style="list-style-type: none"> » Chandigarh 	<ul style="list-style-type: none"> » North-eastern states (excl. Assam)

Table 5 depicts manufacturing innovation performance by income groups (GSDP per capita 2019-20). The states or UTs with innovation scores greater than the income group average *plus* standard deviation are best performers (highest share of firms across respective indicators). States or UTs with innovation scores between the income group average *plus* standard

deviation and income group average *minus* standard deviation are average performers (moderate share of firms across respective indicators). States or UTs with innovation scores less than the income group average *minus* standard deviation are low performers (least share of firms across respective indicators).

TABLE 5: Manufacturing innovation performance by income groups (GSDP per capita 2019-20)

	Above INR 3,00,000	INR 2,00,000 - INR 3,00,000	INR 1,00,000 - INR 2,00,000	Below INR 1,00,000
Performance above expectation		<ul style="list-style-type: none"> » Karnataka » Telangana 		<ul style="list-style-type: none"> » Uttar Pradesh » Madhya Pradesh
Performance in line with expectation	<ul style="list-style-type: none"> » New Delhi » Goa 	<ul style="list-style-type: none"> » Tamil Nadu » Uttarakhand » Maharashtra » Puducherry » Himachal Pradesh » Haryana » Gujarat 	<ul style="list-style-type: none"> » West Bengal » Punjab » Chhattisgarh » Rajasthan » Jammu & Kashmir 	<ul style="list-style-type: none"> » Jharkhand » Assam » Bihar
Performance below expectation	<ul style="list-style-type: none"> » Chandigarh 	<ul style="list-style-type: none"> » Kerala 	<ul style="list-style-type: none"> » Andhra Pradesh » Odisha 	<ul style="list-style-type: none"> » NE states (excluding Assam)

D. OVERVIEW OF IMII KEY RESULTS

The IMII results suggest that while the presence of enablers such as an innovation ecosystem (linkages and knowledge flows) and internal firm capabilities and the absence of barriers are important for innovation, they alone do not guarantee high innovation output (performance) in Indian manufacturing. The study highlights the need for increased efforts in terms of innovation activities and investments to translate the presence of an enabling ecosystem and firm's capabilities and absence of barriers into actual innovations.

The positive correlation between the presence of enablers and performance indicates that increasing enablers would have a greater impact

on increasing performance. The study also suggests that other factors such as education, infrastructure, and government policies, are at play in determining the innovation score, and state income has only a moderate bearing on the innovation ecosystem and performance.

The study identifies Karnataka, Dadra & Nagar Haveli and Daman & Diu, Telangana, Tamil Nadu, and Uttarakhand as the top five innovators, while the North-eastern states (excluding Assam), Bihar, Assam, Jharkhand, and Odisha are the bottom five states in terms of innovation. The absence of barriers scores is higher than enabler scores across all states, with most states scoring higher on the absence of Potential and

capability barriers and absence of policy barriers compared to the absence of financing barriers and market and linkage barriers.

The study suggests that leaders like Karnataka and Telangana are doing better on the three pillars of enablers, particularly on innovation activities and investment, resulting in better innovation performance and a higher share of innovators. The study highlights the need for increased investments in innovation activities to improve innovation performance.

Overall, the results provide valuable insights into the innovation ecosystem of Indian manufacturing and can be used as a tool for policymakers and investors to assess the potential of states for investing in innovation. The study also provides a roadmap for states to improve their innovation ecosystem, by focusing on the enablers and reducing the barriers, and by encouraging innovation activities and investments.



1

INTRODUCTION AND PROJECT CONTEXT

INTRODUCTION AND PROJECT CONTEXT

1.1. BACKGROUND

The Government of India conducted the first National Innovation Survey in 2011 which found that innovations mainly were 'new to the firm',¹⁰ indicating that manufacturing firms were trying to survive market forces by adopting more prevalent market practices (DST, 2014). Particularly, the survey found that the role of innovations in creating a competitive advantage for firms was rather underdeveloped. The severe disconnect observed between production systems and innovation support systems limits firms from pursuing innovations, and other changes envisaged for driving productivity and meeting competition (Arora & Nath, 2015). This forced firms to rely almost exclusively on internal sources for their innovation activities. Notably, the study pointed out that the absence of demand-side dynamics was a key constraint that made the National Innovation Systems feeble.

In 2019, the Department of Science and Technology (DST), Government of India decided to follow up with a second nationwide innovation survey and assigned the task to the United Nations Industrial Development Organization (UNIDO), focused on manufacturing and associated services spread across large, medium, small and micro enterprises. The DST-UNIDO collaboration allowed a 360-degree approach to measure firm-

level manufacturing innovation outcomes, processes and barriers and assess the performance of states, sectors, and firm sizes. The study also closely examined how the ecosystem actors and their interactions affected the innovation outcomes.

1.1.1. THE NATIONAL MANUFACTURING INNOVATION SURVEY

The National Manufacturing Innovation Survey (NMIS) 2021-22 was conducted by UNIDO, and in collaboration with the DST, from February 2021 to May 2022. The NMIS 2021-22 aimed to assist DST in developing robust analytical frameworks for measuring firm-level innovation and the sectoral system of innovation, respectively, by collecting data from manufacturing firms and actors of innovation systems, as a follow-up to the first Indian innovation survey conducted by DST in 2011. Hence, the NMIS 2021-22 survey had two specific components - the firm-level survey and the survey of sectoral systems of innovation (SSI).

The firm-level component of NMIS 2021-22 measured the innovation performance of manufacturing firms in India and assessed the enabling characteristics and barriers to such innovative firms. With the objective of capturing insights regarding activities impacting innovations

¹⁰ Not new to the market or the world

in a firm, the firm-level survey measured a broad spectrum of product and business process innovations and the various factors either enabling or limiting innovation activities.

The SSI component of NMIS 2021-22 aimed to measure the innovation system available to specific industrial sectors to examine how manufacturing firms accessed information, knowledge, technologies, practices, and human

and financial resources, and what linkages connect the innovating firm to other actors in the innovation system (laboratories, universities, policy departments, regulators, competitors, suppliers, and customers). Thus, the SSI component aimed to map the innovation capability of firms to such actors and institutions of the innovation system specific to the industrial sector.

TABLE 1.1: Overview of firm-level survey and survey of sectoral system of innovation

Firm-Level Survey	SSI Survey
<ul style="list-style-type: none"> » Types of innovations achieved by manufacturing firms. <ul style="list-style-type: none"> » Product innovation » Business process innovations in (e.g., operation, product/business process development, marketing & sales, procurement, distribution & logistics, administration, and management) » Innovation input activities » Sources of information, collaborations, and resources » Impacts of digitalization, infrastructure, and IP » Factors hampering innovation activities, and the impact of COVID-19 pandemic 	<ul style="list-style-type: none"> » Innovation actors (firms and non-firm actors) and their networks (density, distribution, directionality, symmetry of intra- and inter-linkages) » The role and impact of actors and institutions on innovation activities in firms » Impact of policy instruments (fiscal, monetary, regulatory, standards and others) » Barriers to innovation

The firm-level survey targeted 10,139 firms, a stratified random sample representing micro, small, medium and large manufacturing across 58 manufacturing sectors and related services

(as per the national industrial classification 2008¹¹ (Central Statistical Organisation, 2008)) across the 36 states and union territories in the country. The SSI survey targeted the innovation

¹¹ National Industrial Classification (NIC) 2008 is an essential Statistical Standard for developing and maintaining comparable data base according to economic activities https://www.ncs.gov.in/Documents/NIC_Sector.pdf

1

systems of 5 key manufacturing sectors critical to the Indian economy, prioritised by their gross value added (GVA) and their presence across the country, impacting state-level and national policies and strategies. These 5 sectors are Food and Beverages, Textiles and Apparel, Automotive, Pharmaceuticals, and, Information and Communication Technologies (ICT). A stratified random sample of 7,851 firms and 1,000 non-firm actors across India were targeted under the SSI survey.

The NMIS 2021-22 survey was launched in February 2021, and taking into consideration of COVID-19 disruptions and restrictions, the survey data collection was held completely online. A team of 30 enumerators with advanced degrees in sciences and survey experiences were hired and trained on firm-level and sector-specific nuances, as well as to conduct the semi-structured interview primarily using video conference and telephonic conversations. The semi-structured interviews enabled constructive detailing of the questions and ensured the capturing of robust and relevant responses. The survey was supported by five major business membership organisations, respectively the India SME Forum (ISF), the Federation of Telangana Chambers of Commerce and Industry (FTCCI), the Federation of Andhra Pradesh Chambers of Commerce and Industry (FAPCCI), the Madras Chamber of Commerce and Industry (MCCI), and the PHD Chamber of Commerce and Industry (PHDCCI). The data collection was completed in early May 2022.

This report features the outcomes of the firm-level survey. The findings of the SSI survey are documented in 5 separate reports.

1.1.2. POLICY IMPERATIVES FOR INNOVATIONS IN INDIA'S MANUFACTURING

The NMIS 2021-22 survey was critically positioned with an overarching goal of informing and supporting *targeted and evidence-based* policy for improving India's innovation mechanisms and manufacturing performance. This is particularly important because the period that followed the 2011 Indian National Innovation Survey, the Government of India launched a series of key policy initiatives to improve the manufacturing agenda in the country and brought attention to the role of technological innovations. The ambitious Make in India is a flagship mission launched in 2014 to boost the manufacturing share in the overall GDP, with attention to 27 key sectors that have played a significant role in the economy (Ministry of Commerce and Industry, 2021). The mission's attention to amplify domestic value addition and technological modernisation is positioned by the intent to make India's manufacturing globally competitive. This serves to significantly increase the manufacturing sector's contribution to the economy, trade, and employment.

The Digital India initiative in 2015 made efforts to provide high-quality internet infrastructure and services across the country to individuals, and for improved governance and services on demand. It has resulted in India becoming one of the biggest and fastest digital adopters comprising more than 600 million consumers by 2023 (Kaka, et al., 2019). The Atal Innovation Mission, established in 2016, has been driving innovation and entrepreneurship across the country through extensive innovation

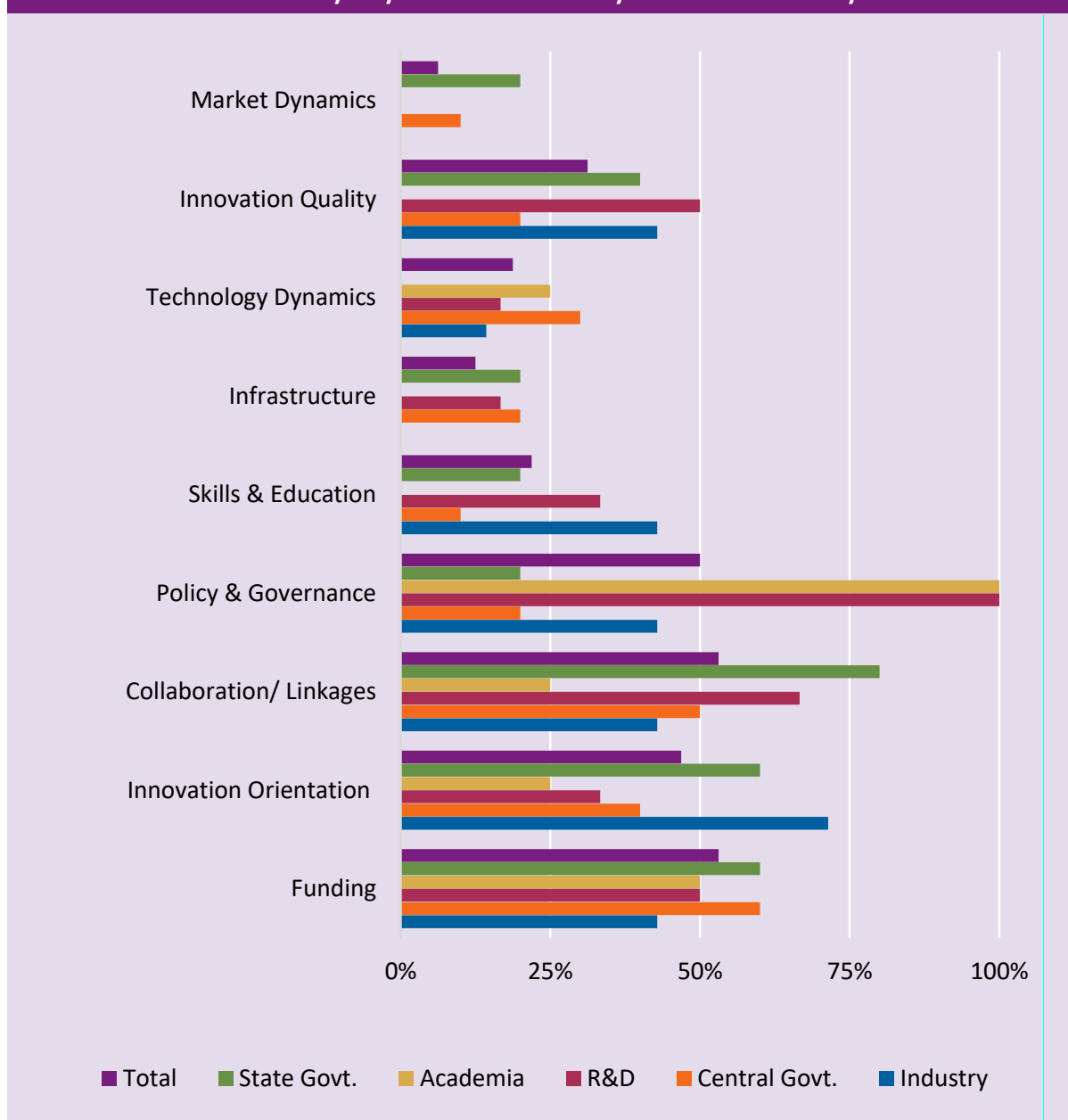
infrastructure and programmes for supporting startups and innovators and enabling student innovators, among others (GoI, 2016). The year 2016 also saw the launch of the Startup India Mission, a comprehensive effort to handhold startups from the ideation phase to commercialisation and build the startup ecosystem (DPIIT, 2021). The National Investment Promotion and Facilitation Agency of India known as 'Invest India' was soon established with an overarching objective of catalysing investments in manufacturing, and technologies and incentivising innovations and other areas of trade and commerce (Invest India, 2022). It can be argued that these efforts have played a key role in driving India upwards in the Global Innovation Index (GII) every consecutive year since 2011, moving from its 62nd position to the 40th by 2022, making it the top innovation achiever among the lower middle-income countries and central and southern Asia (WIPO, 2022). The GI findings also highlight the booming innovation ecosystem in the country, where Delhi, Mumbai, Bangalore and Chennai are in the top 100 science and technology clusters in the world, such that India is identified as the third-largest startup ecosystem in the world, following the US and China (Ministry of Finance, 2021) (GOI, 2021).

While Bain (2022) shares that the VC investments in India pegged at \$38.5 billion in 2021, the fast-paced emergence of risk capital investment for technologies and innovations over the last decade can be thus attributed to the improved business and innovation environment in the country.

India's self-reliance agenda, the Aatmanirbhar Bharat campaign launched in 2020, is a culmination of many of the above-stated initiatives, where the Government of India aspires to achieve a 5-pronged goal of leapfrogging economic growth through modern infrastructure and technology-driven systems. Through strong skilling and robust supply chains, the initiative aims to meet the fast growing demand for goods and services in the country (PIB, 2020).

The self-reliance objectives were, thus, extended to the Make in India initiative in 2011-21 by launching the Production Linked Incentive (PLI) scheme across 14 key manufacturing sectors to incentivise import substitution by domestic production in strategic growth sectors (Invest India, 2020). Thus, the domestic manufacturing ecosystem and supply chains are critical to the success of the PLI scheme, where new technology and innovation penetration are crucial to attract global manufacturing demand to the country and sustain the competition.

FIGURE 1.1: NMIS flash-survey: key bottlenecks faced by the innovation ecosystem in India



A flash survey was held in late 2020 to examine the Indian innovation ecosystem in the light of achieving the goals of Aatma Nirbhar Bharat by understanding, (i) key bottlenecks in the innovation ecosystem in the country; (ii) initiatives required to promote innovations in Indian industries and public research system; (iii) strengthening linkages among various actors; (iv) the utility of Corporate Social Responsibility (CSR) for the industry and Science Social Responsibility for academics or research organisations for innovations; and, (v) the impact of the COVID-19 crisis on human capital, supply chain, technology generation and others. The survey was held among policymakers and other actors and the overarching findings showed that factors like policy governance, collaboration linkages, funding and innovation orientation were key bottlenecks. The findings were used to refine the firm level and systems of innovation survey questionnaires to incorporate the emerging points.

1.1.3. RELEVANCE OF THE FIRM-LEVEL INNOVATION SURVEY

The first national innovation survey showed high novelty innovations at the firm level as acquiring new machinery. However, it also revealed the productivity challenges of firms, especially micro and small industries, which are particularly disadvantaged in accessing technological knowledge, information systems and other institutional provisions (Arora and Nath, 2015). The policy initiatives in the decade that followed aimed to address and strengthen the nation's innovation and manufacturing objectives and its ecosystem. To this end, the India Innovation Index (III) 2021, an indicator of the country's innovation readiness, acknowledges the implications of these efforts, including strong and improved performances in human capital and investments across firms in the states¹². However, the III (2021) brings attention to the uneven business environment across the country, especially the challenges in accessing innovative tools and solutions in trade, competition and market scale, credit, and digital infrastructure, crucial to the survival of the firms. While factors like size, location, age, sector and other related characteristics are critical for firms to take up innovations and succeed, (Shekar & Paily, 2019) point out that innovation successes are determined by the firm's ability to overcome

barriers at the firm and industry level, both in regional and global markets.

Aligning with the latest editions of the India Innovation Index, the Global Innovation Index, and the Global Competitiveness Index, and importantly as a follow-up to DST's first National Innovation Survey, the second innovation survey was designed with a specific focus to objectively measure innovations in manufacturing firms across states, sectors and sizes categories. Hence the design of the firm-level survey has put comprehensive effort into a broader and stronger set of firm-level indicators with attention to innovation potential, capacity, industrial competitiveness, business resilience, and barriers to innovations in manufacturing firms. The survey made efforts to measure if firms could capitalise on their innovation potentiality, considering 70% of firms a decade ago had indicated innovations as introducing new machines and almost 60% of them were engaged in non-technical innovations (DST, 2014). Hence the firm-level assessment examined the linkages and knowledge flow in the innovation ecosystem, for example, if and how innovative firms accessed intermediate institutions offering intellectual property right (IPR) support, technology commercialisation, financing, services related to R&D, and capacity building, among others.

¹² The Indian Innovation Index is annually published by NITI Aayog along with the Institute for Competitiveness, evaluates the innovation environment of all states and Union Territories.

Key findings of first National Innovation Survey (DST, 2014)

- » 70% of innovative firms indicated innovations as acquiring new machines (new to firm), 40% indicated quality/ standard related activities
- » 32% firms indicated product innovation and 34% claimed process innovations
- » 45% of innovative firms were at par with competitors, with increased products, improved quality/standards, better production capacity and reduced environmental impact
- » Domestic financial institutions were key external sources for finance
- » 53% innovative firms had no scientists or engineers (but employed by 8% firms with new product innovations)
- » R&D activities increased with firm size, largely in-house activities and externally funded R&D activities were rare
- » Large firms practiced accessing external source for knowledge and information
- » Quantum of skilled manpower/ training of staff were proportionate to firm sizes
- » 20% of firms of all size used ICT for R&D and technology management. Higher use of ERP in firms with new process and product innovations
- » 36.90% of innovative firms had formal R&D setup and were ahead in 'new to market' product/process innovations, while non-R&D firms prioritised 'new to firm'
- » 59.89% of innovative firms did non-technological innovations, of which 46.48% did marketing innovations and 43.09% did organisational innovations
- » Internal resources a strong barrier for all types of innovation – 70% indicated innovation cost for 'product', 'process' and 'alternative material' key barriers
- » 88% of the innovators indicated access to skilled manpower a key issue
- » 40% found access to knowledge and information an important barrier
- » Regulatory requirements were the highest market barrier and infrastructure the least barrier

1.1.4. STRUCTURE OF THE FIRM-LEVEL REPORT

The strength of the firm-level survey findings lies in the 3 broad dimensions and their detailed indicators drawn from the analytical framework of the survey. The dimensions are the firms' innovation performance (outputs and outcomes); enablers to assess innovation input activities, internal capabilities of firms and the enabling environment (linkages and knowledge flows); and finally, the innovation barriers faced

by firms. These dimensions are measured by 80 indicators. The findings from the 3 dimensions allowed the construction of the 'India Manufacturing Innovation Index (IMII)', which has ranked states, manufacturing sectors, and firms (aggregated by their sizes) based on their innovation performances. Chapter 4 on IMII showcases the rankings. Chapters 5, 6 and 7 on 'Performance', 'Enablers' and 'Barriers', respectively, offer granular insights into the dimensions and their respective pillars and indicators.



2

INNOVATION IN INDIAN MANUFACTURING

INNOVATION IN INDIAN MANUFACTURING

2.1. WHAT IS INNOVATION?

The term 'Innovation' can signify both the process (activity) that is undertaken with an intent to develop new products or processes in an organisation or make changes (either incremental or disruptive) to existing ones and the final outcomes of the innovation process (activity).

The "outcomes" of innovation can be "a new or improved product or process (or a combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process) (OECD, 2018). A product innovation is a new or improved good or service that differs significantly from the firm's previous goods or services, and that has been introduced¹³ on the market. A business process innovation is a new or improved business process for one or more business functions that differ significantly from the firm's previous business processes, and that has been brought into use by the firm. Here, "significantly different" is subjective and will vary depending on the firm's capacities and circumstances. The novelty of innovation is linked to its possible uses (features of a product or process in comparison to its alternatives), and by the prior experiences of its producer and targeted recipients (OECD, 2018). Business process innovations consist of innovations in operations and product or process development, marketing and sales, procurement,

logistics and distribution and administration and management.

This report uses the term "innovation activities" to refer to all developmental, financial and commercial activities undertaken by a firm intended to result in innovation. Innovation activities can be classified into tangible and intangible activities. Tangible innovation activities are related to the acquisition or lease of tangible assets that include the purchase, lease, or acquisition of buildings, machinery, and equipment, as well as the manufacture of these items in-house for internal use (OECD, 2018). Intangible or knowledge-based capital activities include engagement in internal and external R&D, engineering, design and other creative work, marketing and brand equity, IP-related activities, employee training, software development and database, and innovation management. Manufacturing firms' survival and growth are critically dependent on engagement and investment in both tangible and intangible innovation activities.

Innovation has become increasingly crucial to enhance a firm's competitiveness, given the emergence of the knowledge economy, intense global competition and exponential technological advancement. To improve their competitive position in the market, firms are putting more focus on efficiently managing the complex and risky process of innovation (Lawson & Samson, 2001).

¹³ A product is introduced when it is made available for usage by its intended users. The act of introduction is defined as implementation and is the point in time when a significantly different product or business process is first made available for use (OECD, 2018).

Firms engage in innovation activities internally or by sourcing goods or services from external entities. The implementation of innovative activities (processes) and firm performance (innovation outputs and outcomes) have a positive relationship (Bowen, et al., 2010), (Rubera & Kirca, 2012). The impact of innovation activities will also depend on whether the activities were delayed, postponed, or abandoned for a variety of reasons. Such innovation activities may not result in innovations but can generate useful knowledge or information. While the knowledge generated from such activities may not have met their fundamental innovation goals, for example, firms can use the results of their innovation activities, such as new knowledge, information, or innovations, to their advantage, or they can transfer, sell, or license them to third parties.

Factors of policies, institutions, and culture are some key variables influencing innovation in different countries. This has led to the emergence of a systems approach to innovation. A National Innovation System (NIS) consists of "elements and relationships that interact in the production, diffusion and use of new and economically useful knowledge and that a national system encompasses elements and relations either located or rooted inside the borders of nation-state" (Lundvall, 2016). NIS has six core elements - internal organisation of firms, inter-firm relationship, the role of the public sector, institutional set-up of the financial sector, R&D intensity and R&D organisation, and education and training system (Lundvall, 2016). The interaction among the various elements in the NIS is also influenced by the institutions and policies existing in a country. Enterprises are the core of the innovation ecosystem (Lundvall, 2007).

2.2. WHY INNOVATE IN MANUFACTURING?

There is an increasing understanding of the critical role of innovation and efficiency in the growth and development of economies, notably since Schumpeter in 1934 propagated that innovation is the ultimate source of economic development. Innovation systems, triple helix or evolutionary economics, to mention a few of the most influential schools of thought, all in different ways highlight the importance of creating networks and interaction between public and private institutions to create environments favourable to innovation [(Leydesdorff & Etzkowitz, 1998), (Lundvall , 2011)]. These perspectives on innovation agreed on two basic assumptions: i) Innovation delivers economic growth, and thus it creates prosperity for all; ii) Innovation stretches the limits to growth imposed by resource scarcity. This view has become normalized, and it is today a matter of fact for most governments and international institutions. In 2018, for example, the OECD wrote, "[...] well-timed and targeted innovation boosts productivity, increases economic growth and helps solve societal problems" (OECD, 2018). The discourse of innovation has even crossed borders and has become hegemonic within the discourse of economic development in the South (Pansera & Owen, 2018).

The firms' absorptive capacity or the level of technological capabilities and ability to learn determines the firm's capacity to be – and remain - competitive and successful. Therefore, innovation and learning capabilities are vital for firm performance and competitiveness (Cohen & Levinthal, 1989), (Bell & Pavitt, 1993), (Lall & Pietrobelli, 2002).

Firm-level innovation involves the conversion of innovation inputs such as internal R&D, foreign technology and human capital into innovation outputs in products and processes. It is expected that as firms invest in these inputs, productivity and efficiency will increase. It is evident from the literature that globalisation has led to increasingly fierce competition and rapid changes among firms; thus, innovation activities have become a strategic competitive driver in the market (Cho, et al., 2017), (Shekar, 2021). The effect of R&D expenditure on exports is positive and significant (Singh, 2009). In addition to research and development efforts, technology licensing from abroad is considered a measure of technology adoption. Another study conducted for pharmaceutical and electronics industries in India showed that technological factors could prove to be a key determinant of exporting activities by introducing quantifiable concepts of know-how and know-why capabilities (Bhaduri & Ray, 2004).

However, the underlying strategies of innovation adopted by firms and countries may vary depending on the context and level of economic development. Developing countries were historically regarded as the recipients of technology created in developed parts of the world. The diffusion of technology depends on the degree to which firms are exposed to international and new vintage technologies through trade, investment and the ability to absorb and adapt the technologies to which the firms are exposed.

As (Bell & Pavitt, 1995) share, it is assumed that developing countries can achieve high rates of labour productivity as well as total factor productivity by transferring the physical capital

embodying the latest industrial technologies and getting technology licensed from abroad. But dynamic efficiency in production, i.e., improved productivity with firm-level innovation and investments and thereby cost optimisation, cannot automatically be achieved by transferring new technology embodied capital goods or through licensing of related operating know-how. Sustained creation of dynamic efficiencies heavily depends on internal capabilities to generate and manage changes in production technologies. These capabilities are largely constituted by specialised resources such as a skilled labour force and entrepreneurial acumen, which are built up through deliberate and conscious efforts towards innovation activities. The effect of innovation strategies including internal development and external acquisition, on different innovation outcomes reveals that successful product and process innovations mostly occurred through technology adoption from abroad (Goedhuys & Veugelers, 2012). The importance of internal capabilities and efficiencies for technology absorption to pay off cannot be understated as advanced automation becomes more complex in the fourth industrial revolution since the introduction of single-task automation in the first industrial revolution followed by mechanical control systems for machine automation in the second industrial revolution, and then flexible automation with robotic arms particularly in automotive and electronics during the third industrial revolution (UNIDO, 2020).

2.3. IMPACT OF DIGITAL TRANSFORMATION ON MANUFACTURING

Growing awareness and adoption of Industry 4.0, has accelerated the development of heterogeneous digital technologies with the potential of inducing radical transformations in various sectors of the economy. Firms in both developed and developing countries face similar challenges in their digital transformation process. However, developing countries like India may face additional exacerbated systemic conditions and challenges that often cumulate, making it difficult for them to get started on the Industry 4.0 journey (UNIDO, 2020), (UNCTAD, 2019). Firms in developing countries still use – often ineffectively – 3IR Technologies¹⁴. Their lack of command of 3IR technologies, even in basic automation and ICTs make it difficult for them to fully engage with the opportunities of 4IR. The main opportunities for these countries lie, therefore, in the gradual integration of these technologies within existing 3IR production systems and retrofitting production plants in areas of the firm where integration is possible.

Major changes are occurring in global manufacturing and the orientation of science, technology and innovation agendas. Rising demands for new, often difficult-to-determine sets of technological capabilities will be required by increasingly interconnected societies (MEXT, 2016), (Klaus & Xavier, 2016). The diffusion of digital production technologies is a distinct and lengthy process in which different generations of technologies will co-exist for a long time, as

social and economic agents slowly engage in learning and the deployment of earlier technological generations (Andreoni & Anzolin, 2019). This is consistent with the assertion that digital technologies tend to develop within interconnected systems, allowing for the coexistence of different generations of technologies and their convergence and coevolution with other technologies, organisational practices and institutional arrangements (Sadeghi, et al., 2021). Moreover, a necessary pre-condition for developing countries to engage in Industry 4.0 is to accelerate the accumulation of technological capabilities that underpin industrialisation (UNIDO, 2020).

The diffusion of emerging technologies, Industry 4.0 imposes a twin challenge on developing country firms (Andreoni & Anzolin, 2019). First, firms may pursue a follower strategy, whereby their technological capability-building efforts enable them to weather the initial industry 4.0 related shocks, to adapt, transition and eventually thrive in the new technological, organisational and regulatory conditions prevailing in the market. Alternatively, firms may opt to adopt a more ambitious leadership strategy, whereby they aim to become the leading entity in specific markets. These firms will enter new markets as producers of industry 4.0-related emerging technologies or as providers of advanced products or services associated with it, first and foremost by expanding and enhancing their technological capabilities. These two scenarios lend support to distinct specialisations that countries can

¹⁴ Evolutions in production technologies saw assembly line and mass productions, followed by the third industrial revolution (3IR) bringing electronics, ICT, mechatronics and flexible automation with robotic arms aiming for lean production and the recent 4IR for smart manufacturing by converging digital production technologies, nanotechnologies, biotechnologies and new materials, popularly known as Industry 4.0 (UNIDO, 2020)

pursue, either in use or in the production of novel technologies, since it implies different stages of, and efforts towards, technological capability-building and accumulation (Steinmueller, 2001).

While catching up in production and the use of ICTs and related technologies is possible, it remains a relatively complex and uncertain process (Steinmueller, 2001). While catching up in production and the use of ICTs and related technologies is possible, it remains a relatively complex and uncertain process (Steinmueller, 2001). Only a few countries possess the foundations of accumulated technological, including manufacturing and investment, capabilities that are required to lead the 4IR (Horst & Santiago, 2018). Hence, the scope for developing countries to leapfrog tends to be greater.

From the above, it can be inferred that firms need to build and accumulate a set of technological capabilities for beneficial adaptation and adoption of Industry 4.0. This process is supported by targeted firm-level investments in

innovation and technology absorption capabilities, the achievement of a minimum capability threshold or the development of basic production capabilities to foster upgrading and access to the enabling infrastructural capabilities necessary for the deployment of newer and more advanced technologies.

2.4. INDIA IN THE GLOBAL CONTEXT

The innovation ecosystem in India has been improving over recent years, as also indicated by the Global Innovation Index (GII)¹⁵. Table 2.1 shows, India moved up from 57 in 2018 to 40 in 2022, in the GI ranking. While India ranks relatively better among the lower-middle income countries, it is second among the BRICS (Brazil, Russia, India, China, South Africa) countries, although with a substantial gap compared to China which is ranked 11. In its Gross Domestic Expenditure in Research and Development or GERD as a percentage of GDP, India is among the lowest and slightly over South Africa.

¹⁵ The Global Innovation Index (GII) published annually by the World Intellectual Property Organization (WIPO) provides a comprehensive assessment of about 150 countries. It adopts an innovation system perspective, capturing various factors influencing innovation such as political environment, business environment, infrastructure, R&D spending, etc. and innovation output indicators such as patents, high-tech manufacturing, scientific and technical publications, export of cultural and creative services, etc. The latest report – GI 2022, covers 81 indicators and countries are ranked based on the aggregate score they receive for these indicators.

TABLE 2.1: India's comparison with leading countries in the GII 2022 on select indicators

Country	Income status as defined by the World Bank	GI Rank in 2022	GERD PPP Bn 2019	GDP Per capita (PPP, Current International \$) 2021	GERD % GDP 2020	Patent Applications by Residents (2020)	Patents Application by Residents (Per billion PPP\$ GDP) 2020	Utility Patent Applications by Residents at the (Per billion PPP\$ GDP) 2020	Science and Engineering Publications 2020
Switzerland	High	1	18.6	77324.1	3.1	9492	15.1	NA	NA
United States	High	2	668.4	69287.5	3.5	269586	12.9	NA	455900
Sweden	High	3	19.3	59324.0	3.5	6183	10.9	NA	NA
United Kingdom	High	4	56.9	49675.3	1.7	17709	6.0	NA	15600
China*	Upper middle	11	525.7	19338.2	2.4	1344817	55.6	120.7	669700
Bulgaria	Upper middle	35	1.2	26705.4	0.9	293	1.8	3.2	NA
Malaysia	Upper middle	36	9.3	29617.3	1.0	989	1.1	0.1	NA
Turkey	Upper middle	37	24.2	30472.4	1.1	8520	3.3	1.4	NA
Russia*	Upper middle	47	44.5	32803.4	1.1	24212	5.9	2.2	NA
South Africa*	Upper middle	61	6.0	14420.2	0.6	542	0.7	--	NA
Brazil*	Upper middle	54	36.3	16056.0	1.2	5280	1.7	0.8	NA
India*	Lower middle	40	58.7	7333.5	0.7	23141	2.6	NA	149200
Vietnam	Lower middle	48	3.6	11553.1	0.5	1021	1.0	0.4	NA
Iran	Lower middle	53	9.7	15791.2	0.9	11396	10.2	0.3	NA
Ukraine	Lower middle	57	2.5	14219.8	0.4	1361	2.5	9.3	NA

*BRICS countries

Source: Compiled and computed from GII 2022, World Development Indicators (World Bank), WIPO Statistical Country Profiles, and National Science Foundation (2022)

India's GERD as a percentage of GDP has been in the range of 0.6-0.8% during the last two and half decades. The average growth in the per capita GDP during the last decade (2011-2020) has been 3.9%¹⁶. However, the GERD-GDP ratio has not increased in comparable proportions.

The government sector accounts for much of the GERD in India, unlike most other countries.

In India, the Government sector (Centre and states combined) contributes 56% of the gross spending on R&D as compared to 10% in the United States, 16% in China and 7% in the United Kingdom in 2019. The industrial sector accounts for only 37% of GERD in India whereas it accounts for more than two-thirds of gross spending in other leading countries.¹⁷.

¹⁶ Estimate based on the GDP Per Capita Growth (Annual %) provided by the World Bank <https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG>

¹⁷ Based on National Science Foundation (2022)

TABLE 2.2: R&D spending in select Make in India sectors (INR Crores, in 2017-18)

Sector	Central Govt. Ministries/ Depts	Public Sector Industry	Private Sector Industry	Total	Share of Sectoral R&D in GERD (%)
Automobiles and components	--	0.9	6849.0	6849.9	6.0
Biotechnology	1771.7	0.1	1071.3	2843.1	2.5
Chemicals (excluding fertilizers)	4.7	15.6	3004.6	3024.9	2.7
Defense	15195.9	2712.2	140.3	18048.4	15.9
Food Processing	67.3	0.1	245.9	313.3	0.3
Medical Devices	--	6.6	1278.0	1284.6	1.1
Pharmaceuticals	28.6	3.2	10159.1	10190.9	9.0

Source: Compiled from DST 2020.

Table 2.2 shows that seven sectors accounted for 37.4% of the total R&D spending in India in 2017-18. These seven sectors are from the 27 sectors covered by the Government of India's Make in India programme. Much of the spending is in three sectors – defence, pharmaceuticals, automobiles, and components. In the defence sector, more than four-fifth of the R&D spending is borne by the DRDO. While the public sector industry accounts for 15% of R&D in the defence sector, the share of the private industry is less than 1%. Since the entry of firms into the defence sector is highly regulated, it is evident that the private industry would have a lower share in R&D spending. Biotechnology is another sector where the Central government department (Department of Biotechnology) accounts for much of the R&D spending (DST, 2020).

As private firms are central to the national innovation ecosystem, R&D spending by the private sector is crucial. In India, the private sector industry accounts for 88% of the R&D by the industrial sector. In the seven sectors, the private industry accounts for a little more than half (53.5%) of the total R&D spending by the central government and public and private sector industries. Of the 88% of the R&D spending in the industrial sector, 47% is in two sectors - pharmaceutical and automotive¹⁸. Much of the R&D spending in these two sectors is concentrated among a few firms – the share of the top 10 firms in terms of R&D expenditure in the total R&D spending in pharmaceutical and automotive in 2019-20 was 59% and 94%, respectively (CMIE, 2020).

¹⁸ Based on DST 2020, see table-6

According to the Centre for Technology, Innovation and Economic Research (CTIER) (CTIER, 2021), foreign private-sector R&D spending in India is underreported. In contrast to the official reporting of the expenditure made by 146 foreign R&D centres in India to the tune of \$945 million in 2017-18, CTIER estimates foreign private sector R&D spending to be \$8.4 billion in 2016 (61 MNCs) and \$10.5 billion in 2019 (65 MNCs). Further, (Forbes, 2022) estimates that the share of GERD in GDP would be 1.2% if private sector R&D were included as against the current estimate of 0.7%. Accounting practices in India exclude certain categories of firms from the mandatory requirement of reporting R&D data, which can also result in underreporting of the R&D spending (Joseph, et al., 2019).

The number of resident patent applications is a widely used innovation output indicator to capture the innovation activities in an economy. Among the countries listed in Table 2.1, India ranks fourth in the total number of resident patent applications. Among the BRICS countries, it ranks second after China, once again with a substantial gap. Over the last decade, the share of resident patent applications in India increased from 21% in 2011 to 42.7% in 2021 (WIPO, 2022)¹⁹; in other words, non-resident applications accounted for 57.3% of the total applications in 2021. Despite doubling resident patent applications in a decade, India has only 2.6 resident patent applications per billion PPP\$ GDP compared to 55.6 in China.

A key challenge for India is the significant number of patent applications that are left abandoned, which do not reach the final scrutiny

stage. The data provided in the Annual Report (2019-20) of the Office of the Controller General of Patents, Designs, Trademarks and Geographical Indications on the number of patent applications and the number of abandoned patents on account of not meeting the requirements of the Patents Act, shows that the share of abandoned patents in the total number of patent applications is a significant 48% in 2019-20 (Joseph, 2022). This is a steep increase in patent abandonment from 13.6% in 2010-11.

A recent report by India's Economic Advisory Council to the Prime Minister highlights how the challenges with long pendency in the patent office of India discourage innovators from pursuing applications containing innovations with short life spans. The average time to process patent applications in India is about 60 months compared to 20 months in China and 21 months in the United States (Sanyal & Arora, 2022).

As observed in Table 2.1, most countries, except the high-income economies, provide data for utility patents. However, India does not provide utility patents. A utility model patent system is important in providing protection for minor innovations, which do not fulfil the patentability criteria. In China, the number of utility patent applications by residents is more than double of their patent applications. The experience of East Asian countries suggests that utility patents and industrial design patents can effectively encourage domestic enterprises to undertake minor adaptive innovations and promote innovation-based competition among them

¹⁹ World Intellectual Property Organization (WIPO) (2022). World Intellectual Property Indicators 2022. Geneva. WIPO. DOI:10.34667/tind.47082

(Kumar & Joseph, 2022). A UNCTAD-ICTSD study (Suthersanen, 2006) points out that a utility model patent system or a second-tier patent regime would improve the legal environment for SMEs, especially those engaged in incremental innovation and adaptations. The lack of a utility model system in India is a lacuna in the legal system that India has created for incentivising innovations in the country (Basant, 2021).

Scientific and technical publications are an indicator of innovation activities taking place in an economy, especially in the higher education sector and public research institutions. Six countries produced more than half of total peer-reviewed such publications in 2020 - China (23%), the United States (16%), India (5%), Germany (4%), the United Kingdom (4%), and Japan (3%) (National Science Foundation, 2022).

Among the top six countries, India registered the highest growth (146%) in the number of publications between 2010 and 2020, resulting in India's share in global publications increasing from 3% to 5%. In India, the percentage of the higher education sector in GERD has been growing steadily, from 5% in 2013 to 7% in 2018.²⁰

THE ENABLING ENVIRONMENT

The creation of an enabling environment for innovation has become a priority for policymakers in many countries. The GII captures various aspects of this enabling environment. Table 2.3 shows comparative data of India with other leading countries on three key enabling indicators, viz., business environment, logistics performance, and ICT use.

TABLE 2.3: Scores for Key Enabling Indicators in Leading Innovative Countries

Country	GII Rank in 2022	Business Environment		Logistics Performance	ICT Use
		Doing Business Policies	Entrepreneurship Policies		
Switzerland	1	91.5	80.0	86.0	88.2
United States	2	78.6	72.0	85.6	84.0
Sweden	3	63.7	46.2	93.0	86.5
United Kingdom	4	59.3	52.7	90.2	87.3
China	11	71.9	77.3	72.6	75.3
Bulgaria	35	41.5	27.1	45.6	71.0
Malaysia	36	62.2	62.6	54.4	73.9
Turkey	37	38.4	34.3	51.2	66.3
India	40	40.6	72.1	56.2	45.0

²⁰ Based on UNESCO statistics - Science, technology and innovation: GERD by source of funds <http://data.uis.unesco.org/Index.aspx?queryid=76>

Vietnam	48	63.3	60.7	56.7	62.2
Iran	53	22.0	4.6	37.2	68.2
Ukraine	57	34.1	NA	36.3	63.8
Brazil	54	35.4	12.8	43.7	62.9
Russia	47	42.1	24.6	33.0	76.9
South Africa	61	32.6	17.1	61.9	56.9

Source: Compiled from GII 2022, that used World Bank's logistics performance index (LPI) report (2018) to assign country scores

The business environment consists of two indicators – the government's ability to provide a stable environment for doing business and entrepreneurship policy and culture. In the overall business environment, India ranks 40 in GII 2022. In 2022, the GII used survey questions to measure “doing business policies”. Earlier rounds of GII had used the ease of doing business and ease of resolving insolvency indicators from World Bank's ‘Doing Business’ reports. While India fares well on entrepreneurial policies and culture, it lags behind in a stable environment for doing business.

The LPI, prepared by the World Bank, is an aggregate measure covering six sub-indicators: (1) customs, (2) infrastructure, (3) international shipments, (4) logistics competence, (5) timeliness, and (6) tracking and tracing. Table 2.3 gives the scores that each country has received for the logistics performance. India's global position in the LPI index has declined from 39 in 2007, the year from which the LPI index is available, to 44 in 2018. Between 2016 and 2018, India's ranking in all the six sub-indicators has fallen (Figure 2.1).

FIGURE 2.1: Trends in Logistics Performance Index for India



Source: Aggregated Logistics Performance Index (LPI) - World Bank²¹

²¹ This figure is prepared by Dr. Ramaa Arun Kumar, Assistant Professor at ISID using World Bank's Aggregated LPI <https://lpi.worldbank.org/international/aggregated-ranking>

ICT is a key enabler, but interestingly, India's score in this regard is the lowest among all the countries in the sample, including all BRICS countries. The ICT indicator that GII uses is a composite index consisting of (1) Percentage of individuals using the internet, (2) Fixed (wired) broadband internet subscriptions per 100 inhabitants; (3) Active mobile broadband subscriptions per 100 inhabitants; and (4) Mobile broadband internet traffic. On the contrary, India leads the charts along with China in the Global Fintech Adoption Index 2019, covering 27 countries (Ernst & Young, 2019). It was found that 87% of the respondents were using fintech services as compared to 64% in

Switzerland and 46% in the United States. It shows that consumers in India are way ahead in the use of fintech services that require access to the internet.

FOREIGN DIRECT INVESTMENT

Foreign Direct Investment (FDI) has the potential of enhancing the innovation capability and competence of domestic firms through so-called spillover effects, which are generated through collaboration, imitation and movement of personnel. Table 2.4 gives the details of FDI inflows to leading innovative economies.

TABLE 2.4: FDI Inflows to Leading Innovative Economies

Country	Yearly FDI Inflow (2019-21 average) US\$ Billion	Share of FDI Inflow in Global FDI Flows (2019-21 average) %	GII 2022	
			FDI inflows % GDP	Rank
Switzerland	- 267.5	-6.6	-18.3	131
United States	743.3	18.5	1.2	96
Sweden	54.9	1.4	2.8	52
United Kingdom	91.2	2.3	0.1	119
China	471.5	11.7	1.5	86
Bulgaria	6.8	0.2	3.3	39
Malaysia	22.6	0.6	2.0	72
Turkey	29.9	0.7	1.3	91
India	159.4	4.0	1.9	77
Viet Nam	47.6	1.2	6.5	15
Iran	4.3	0.1	0.7	109
Ukraine	12.5	0.3	2.6	56
Brazil	144.1	3.6	3.5	37
Russia	80.7	2.0	1.0	101
South Africa	49.1	1.2	1.2	94

Source: UNCTAD and GII 2022

India accounts for 4% of global FDI flows and India is increasingly becoming an attractive destination for FDI. Its share increased from 0.3% in 2000 to 2.0% in 2010 and to 7% in 2020. While much of the FDI inflows into India went into the services sector during the previous decade, the shift towards the manufacturing sector in recent times has been significant. (Dhar & Rao, 2020) show that services accounted for 58% of FDI inflows during the period between 2010-11 and 2017-18, followed by manufacturing (33%) and other sectors. The recent data shows that the manufacturing sector received nearly half (48%) of FDI inflows in 2021-22 whereas services received 44%.²²

An important observation from Table 2.4 is that leading innovative countries are not necessarily also leading countries in receiving FDI. Sweden accounts for only 1.4% of global FDI flows. Although the United States accounts for 18.5% of global FDI flows, its share in GDP is minimal. In fact, all the countries, except Vietnam, rank very low in terms of FDI inflows-GDP ratio. The innovation capability of a country is a function of

the interaction of various elements in the NIS, and FDI is only one element of the NIS. The quality of FDI is an important factor determining the impact of FDI on innovation. Studies have shown varying effects of FDI on host country economies. Key indicators to capture the quality of FDI are localisation of output by MNC affiliates, contribution to the development of modern industries, export orientation and R&D expenditure (Kumar, 2002).

The R&D intensity is very low for FDI firms in India - 0.2% in 2020-21. The report of the Reserve Bank of India (RBI) on the Finances of Foreign Direct Investment Companies, which provides data on sales and R&D spending by FDI firms, is based on a sample of FDI firms in India. It may be possible that this sample consists of FDI firms that spend less on R&D. In fact, the R&D intensity of FDI firms varies between sectors. While FDI firms in the pharmaceuticals sector witnessed an R&D intensity of 6% during 2008-09 to 2011-12, the same for medical devices was 0.1% and for chemical substances, 0% (Joseph & Ranganathan, 2016).

TABLE 2.5: Some indicators of the quality of FDI in India

Year	All Foreign subsidiaries		Foreign subsidiaries in manufacturing		R&D/Sales % (Based on 2059 FDI Firms)
	Export/ Sales (%)	Import/ Purchases (%)	Export/ Sales (%)	Import/ Purchases (%)	
2018-19	31.0	38.8	18.7	45.6	0.1
2019-20	32.6	34.8	20.1	45.2	0.1
2020-21	34.1	33.5	20.6	45.3	0.2

Source: Census on Foreign Liabilities and Assets of Indian Direct Investment Entities, RBI, Various Years and Finances of Foreign Direct Investment Companies, RBI (2022).

²² Based on Census on Foreign Liabilities and Assets of Indian Direct Investment Entities for 2021-22, published by RBI on 22 September 2022.

FDI IN R&D

Internationalisation of R&D takes place through two routes – FDI and contractual arrangements. Host countries of such R&D investments are expected to benefit from the spillover effects and linkages with the host country NIS. Among the two routes, the FDI route is more beneficial for host countries still in the catching-up process, as MNCs are believed to be transferring their superior technologies and management and organisational practices to their affiliates.

Global Capability Centers (GCC) are MNCs' offshore in-house or captive centres. India has become a preferred destination for GCCs in R&D.

According to the data provided by the National Science Foundation of the United States (Moris, 2022), India is the second most preferred destination, after the United Kingdom, for foreign R&D by the US-owned MNCs. In 2019, the US MNCs spent US\$ 9.9 billion on R&D in India, which was 9.4% of total foreign R&D spent by the US MNCs.

Out of the globally leading top 2500 R&D spending firms, 65 among the top 100 have established their R&D centres in India (Table 2.6). These 65 firms spending on R&D was US\$ 350 billion in 2018-19, which was more than one-third (37%) of the gross spending on R&D by the 2500 firms.

TABLE 2.6: Global leaders in R&D and those having R&D centres in India (2018-19)

Firms	Total R&D expenditure (US\$ Bn.)	Share in total of top 2500 (%)
Top 2500 global R&D firms	947	100
Top 100 global R&D firms (among the 2500 firms)	497	52
65 global R&D spenders (in top 100 with R&D centres in India)	350	37

Source: CTIER 2021

The focus of firms on digital transformation using new technologies such as Artificial Intelligence (AI), Internet of Things (IoT) and Machine Learning (ML) requires a lot of talent which is available in India. Indian GCCs play a crucial role in the digital transformation of their parent firms (Krishnan, 2019).

Recognising the importance of R&D GCCs in enhancing India's innovation ecosystems, the Economic Advisory Council to the Prime Minister

recommended (in 2019) doubling FDI in R&D by 2022. It appears that foreign R&D centres are playing an important role in the innovation ecosystem of India. During the period between 2009 and 2016, about 79% of the patents awarded to inventors in India by the patent office of the United States went to individuals working in these R&D centres (Krishnan, 2019). At the same time, studies on foreign R&D centres in India (Mrinalini, et al., 2013), (Joseph, et al., 2019) have shown that they have not,

except in a few cases, created linkages with local firms and academic institutions. They operate in silos, catering to the needs of their parent firms. As a result, they seem to have not created the kind of spill-over effects they could have otherwise created. In China, joint ventures were

the most important channel for establishing GCCs accounting for 54.5% of the R&D spending by foreign-funded enterprises in China in 2013²³. Information on the contribution of foreign R&D centres in the GERD of India is not available.

HUMAN CAPITAL

TABLE 2.7: Graduates from Science, Technology, Engineering and Mathematics programs in 2020 (% of total tertiary graduates)

Country	STEM Graduates % of Total Tertiary Graduates	GII 2022 Rank for STEM Graduates
Switzerland	25.2	39
United States	19.2	76
Sweden	27.0	31
United Kingdom	26.2	33
China	NA	NA
Bulgaria	19.5	71
Malaysia	38.9	3
Turkey	15.2	97
India	33.7	11
Viet Nam	22.7	54
Iran	39.0	2
Ukraine	24.3	41
Brazil	18.5	82
Russia	31.4	14
South Africa	18.3	84

Source: Compiled from GII 2022

²³ Computed based on Statistics on R&D Activities and Patents of Industrial Enterprises, China Statistical Year Book 2014, <http://www.stats.gov.cn/tjsj/ndsj/2014/indexeh.htm> (accessed on 15 December 2018).

Table 2.7 provides the share of STEM graduates in total tertiary graduates in countries and the corresponding ranking. In India, one-third of the tertiary graduates are from STEM disciplines. India ranks 11 among all the countries covered

by the GII, and also tops the BRICS countries, excluding China. India accounts for 32% of the total number of STEM graduates globally (Kishore, 2022).

TABLE 2.8: Enrolment at Graduate, Postgraduate and MPhil/PhD Levels for STEM Courses in India in 2019-20

Discipline	Male	Female	Total
Science, including Mathematics	2563386	2903384	5466770
Medical Sciences	643510	922742	1566252
Veterinary and Animal Sciences	16421	10659	27080
Fisheries Science	3806	3410	7216
Criminology and Forensic Science	1250	1717	2967
Marine Science/Oceanography	1705	888	2593
Science and Mathematics Total	3230078	3842800	7072878
Engineering and Technology Total	2788872	1168149	3957021
IT and Computer	562149	406672	968821
Engineering and Technology Total	3351021	1574821	4925842
Grand Total	6581099	5417621	11998720

Source: Compiled and computed by the author based on the Ministry of Education (2020).

According to Table 2.8, the total number of students enrolled for STEM disciplines at graduation, post-graduation and MPhil/PhD levels was approximately 12 million in 2019-20. Students at the graduate level account for 89% of the total enrolment, followed by 10% at the post-graduation level and 1% at the MPhil/PhD level.

Female students outnumber male students in sciences, including mathematics, medical sciences, criminology and forensic science disciplines. Even at the post-graduation level female students outnumber male students – 690463 female students and 550462 male students.

2.5. COMPARATIVE STI POLICY OVERVIEW

Overview of STI strategies of India

India released in January 2021 the consultation draft of its 5th national Science, Technology and Innovation Policy (draft STIP 2020) (Department of Science and Technology, 2020) to align with national priorities, sectoral focus and strategies and also position itself as a knowledge super-power. The draft STIP 2020 seeks to develop 'Research and Innovation Excellence Frameworks' to enhance the quality of research along with the promotion of engagements with relevant stakeholders, achieving accountability and global standards. It aims to build an 'Open Science Framework', to provide access to scientific data, information, knowledge, and resources to everyone in the country and those engaging with the Indian STI ecosystem on an equal partnership basis, enabled by an open centralised database platform for all financial schemes, programmes, grants and incentives existing in the ecosystem.

The draft STIP 2020 presents a new approach to address challenges in the STI ecosystem by creating institutional mechanisms and linking research, innovation, and translation. It also focuses on promoting inclusion and entrepreneurship, as well as developing key institutions and intermediary organisations. In addition, the strength of this policy is in its alignment with other government policies such as Atal Innovation Mission, Start UP India, IPR Policy 2016, Make in India, and Atma Nirbhar Bharat, creating a unified vision for India. Further, a National STI Observatory is proposed to be

established as a central repository of comprehensive data from the STI ecosystem.

To amplify STI education, universities will be established to promote interdisciplinary research and address skill building, training and infrastructure development with 'Higher Education Research Centres' and 'Collaborative Research Centres'. Importantly, the Government of India aims to improve its Gross Domestic Expenditure on R&D (GERD) over five years to diversify and enhance to double the share of extramural R&D support of the central government agencies, besides state allocation for STI-related activities under a separate budget head. Foreign multinational companies are expected to collaborate with domestic private and public sector entities on projects aligned to national needs and priorities. STI investments are expected to increase through boosting fiscal incentives and enhancing support to industry, especially MSMEs, for pursuing research through innovation support schemes, and other relevant means on a need basis.

Manufacturing driven STI agenda of Germany

Germany's economic strength is underpinned by one of the world's most advanced innovation systems (OECD, 2022). The role of industry in generating investment, jobs and innovation has been pivotal to the shaping of German STI policy as well as influencing programmes and instruments towards firms that are active in these areas. The industry has strong linkages between research and industry, and internationally leading research and applied research institutions, supported by industry and government, with a strong track record of commercialising research.

Moreover, innovation receives a great degree of political recognition in Germany such that the economy retains a significant manufacturing sector and remains strongly export-oriented.

However, also Germany faces challenges with respect to weak innovative business-creation dynamics; difficulties in transferring new ideas and results from public research into new products or services; slow adoption of digital technologies; and unexploited potential of diversity, such as wider participation of women. To this end, some of the key STI policy initiatives of the German Federal Government include the 'Transfer Initiative' developed by the Federal Ministry for Economic Affairs and Climate Action to respond to the challenges of technology transfer between research and the private sector, the 'From the Idea to Market Success Programm' to accelerate the transfer of ²⁴ technology to the market (Federal Ministry for Economic Affairs and Climate Action, 2021), the 'Central Innovation Programme for SMEs' for inter-firm collaboration in different areas of market-oriented and high-risk innovation, the 'Competence Centre for Innovative Procurement project' to support pre-commercial procurement, thereby accelerating the transfer of high-potential ideas to the marketplace and growing policy attention to "breakthrough" innovations via the 'Federal Agency for Disruptive Innovation' (OECD, 2022).

High R&D expenditures show in Germany's large global footprint in patents. In 2020, Germany accounted for 30% of all Patent Cooperation Treaty applications in Europe and 6.7% globally

and was the second-largest applicant to the European Patent Office, after the United States (German Patent and Trade Mark Office, 2020). The country's open and trade-intensive economy features strong and well-developed links to global value chains, relying heavily on input imports for production and foreign demand to sell its products. The Mittelstand - Germany's small and medium-sized companies, which represent the vast majority of firms and account for half of the value added, play an important role in driving innovation in the country. While large firms are among the most significant business-sector players in innovation, they are in the minority, considering over 99% of German firms have fewer than 500 employees and fall in the size category referred to in Germany as the Mittelstand (Dowling, n.d.).

STI for human-centred societies in Japan

Japan is the first Asian country to succeed in industrialisation and catch up to industrialised countries; and has the world's third largest economy in terms of nominal GDP. It is one of the largest investors in STI by R&D expenditure. According to the National Science Foundation (OECD; Japan, 2021), Japan ranks fourth after the US, the PRC, and the EU when comparing R&D investment in each country as of 2015. Domestic private investments, including businesses and non-profit organizations, accounted for 79.1% of total R&D spending in 2017. The current 'Basic Plan', under Japan's Council for Science, Technology and Innovation, prioritises innovation to address societal challenges, with broad visions

²⁴ Germany's Federal Ministry for Economic Affairs and Energy (BMWi) supports companies to take their research findings as products/services to the market, through a programme called "Von der Idee zum Markterfolg" (From the idea to market success) and helps in various challenges and phases of the innovation process <https://www.bmwk.de/Redaktion/EN/Publikationen/Technologie/from-the-idea-to-market-success.pdf>

of 'Society 5.0' where human-centred society can achieve both economic growth and address social challenges (Government of Japan, 2021). The Plan responds to a wide variety of social needs and aims to help Japan prepare for rapid changes triggered notably by the ongoing digital transformation, besides its strategic objectives for 'nationally critical technologies' with a long-term focus.

Japanese manufacturing has always played a key role in the country's technological competitiveness. To overcome the economic sluggishness, the country has prioritised "S&T superpower" as one of its growth strategies. To this end, it seeks to change the government system for the actual justification of S&T and the acquisition of overseas markets. Under the mid and long-term policies, a comprehensive strategy for STI is selected every year. Such strategies include the National Energy and Environmental Innovation Strategy for Technological Innovation towards 2050, Innovative Research and Development Promotion Program, and Strategic Innovation Creation Program (OECD; Japan, 2021).

STI as a public policy positioning in Sweden

Various policy reforms in the 1990s, along with accelerated growth of GDP and productivity, has continued the growth momentum in Sweden in the 21st century as well. Collaborative initiatives between the state, large industrial firms and labour unions have been pillars of Sweden's development. While public procurement played an important part in the emergence of large, globally operating Swedish firms, the country's strong industrial base with a broad range of products and economic activities has been the economy's bellwether. Furthermore, Swedish manufacturers

have been leading market sophistication by successfully integrating high-end service components into their products (e.g., engineering, maintenance, network management), and market services have grown dynamically. Sweden's extensive and highly developed services sector accounts for an increasingly large share of aggregate employment. To this end, some of the key strengths of the Swedish Innovation Ecosystem are the following (OECD, 2016):

- Successful socioeconomic development, combining economic success with a high degree of equality and outstanding quality of life with wide public acceptance of STI for sustainable future growth.
- Specialisation at the high end of global value chains and fast-developing innovative services.
- Good framework conditions for innovation, including solid macroeconomic fundamentals and institutions, a robust financial system and a supportive business environment.
- A strong human resource base with high investment in R&D and other knowledge-based capital and a strong ICT infrastructure. Excellence in industrial R&D and innovation.
- A strong science base with high inputs, strong actors (notable research universities) and high research output in the number and quality of scientific publications.
- Participation in international academic and industrial networks, including in key areas such as pharmaceuticals, ICT and engineering.
- High-quality of institutions, which fosters transparency and high levels of trust, reduces transaction costs and facilitates adaptation to changing environments.

The 'Smart Korea' strategy with STI

South Korea has implemented various innovation policies over the years to support and foster innovation in the country. Some of the key policies are:

- **The Creative Economy Initiative:** This policy aims to promote innovation and entrepreneurship by combining different sectors of the economy to create new value. The initiative supports startups and small businesses by providing funding, mentoring, and other resources.
- **The Five-Year Plan for Science and Technology:** This plan outlines the government's goals and strategies for promoting research and development in science and technology. The plan includes initiatives to support emerging technologies like artificial intelligence, biotechnology, and the Internet of Things.
- **The National Research and Development Program:** This program provides funding for research and development projects in key sectors like healthcare, energy, and information technology. The program also includes initiatives to support collaboration between industry, academia, and government.
- **The Smart Korea Strategy:** This policy aims to make South Korea a leader in the development and adoption of smart technologies. The strategy includes initiatives to support the development of smart cities, the Internet of Things, and other emerging technologies.
- **The Korean New Deal:** This is a recent policy initiative aimed at creating new jobs and promoting economic growth in the wake of

the COVID-19 pandemic. The Korean New Deal includes initiatives to support the development of green technologies, digital infrastructure, and other key areas.

Overall, South Korea's innovation policies are characterised by a strong focus on collaboration between government, industry, and academia, as well as a willingness to invest in emerging technologies and sectors. These policies have helped to make South Korea a leader in innovation and a major player in the global economy (OECD, 2020).

- **The Basic Science and Technology Law:** This law provides the legal framework for Korea's national research and development (R&D) activities. It establishes the roles and responsibilities of various government ministries and agencies involved in R&D and provides guidelines for the allocation of resources to specific research areas.
- **Technology Development Programs:** These programs are designed to promote the commercialisation of new technologies and provide support for small and medium-sized enterprises (SMEs) in Korea. The government provides financial and technical assistance to SMEs to help them develop new technologies and bring them to market.
- **Intellectual Property (IP) Policy:** Korea has put in place a comprehensive IP policy to encourage innovation and protect the intellectual property rights of Korean companies. The policy includes measures to increase the number of patents filed, improve the quality of patents, and strengthen the enforcement of IP rights.
- **Creative Economy Policy:** The Creative Economy Policy is an initiative that seeks to

create new business opportunities and jobs by combining technology with various industries such as culture, tourism, and agriculture. The government is promoting innovation in these industries by supporting startups and small businesses and encouraging collaborations between different industries.

- **Science and Technology Diplomacy:** This policy seeks to promote international collaboration in science and technology. The Korean government has established partnerships with other countries to promote joint R&D and technology transfer, and to share scientific knowledge and resources.
- **Green Growth Policy:** The Green Growth Policy aims to promote sustainable economic growth while reducing greenhouse gas emissions and preserving the environment. The policy includes measures to promote green technology development and increase the use of renewable energy sources.

All of these policies have contributed to the success of Korea's innovation ecosystem by promoting research and development, commercialisation of technology, protection of IP rights, and collaborations between different sectors and countries. By focusing on these key areas, Korea has been able to establish itself as a global leader in innovation and technology (Lee, 2019).

South Korea's success in innovation and manufacturing can be attributed to a combination of various factors, including:

- **Strong government support:** The South Korean government has been provided significant support to the innovation and manufacturing sectors. The government has established various programs and policies to

support R&D and innovation, such as the ones mentioned earlier.

- **Focus on education:** South Korea has a strong focus on education and has been investing heavily in its education system, with a particular emphasis on science, technology, engineering, and mathematics (STEM) education. This has created a skilled and educated workforce that is well-suited to the needs of the country's innovation and manufacturing sectors.
- **Strong corporate culture:** South Korean companies have a strong corporate culture that values hard work, innovation, and long-term planning. This has helped them to develop and maintain a competitive edge in global markets.
- **Strategic location:** South Korea's strategic location has also played a role in its success in innovation and manufacturing. The country is located in a region that is home to many of the world's largest and fastest-growing economies, which has provided South Korean companies with access to large and growing markets.
- **Investment in infrastructure:** South Korea has invested heavily in its infrastructure, including transportation, telecommunications, and energy. This has helped to create an environment that is conducive to innovation and manufacturing.

Overall, South Korea's success in innovation and manufacturing can be attributed to a combination of government support, education, corporate culture, location, and infrastructure. These factors have helped South Korea to become a major player in the global economy and a leader in innovation and manufacturing.

China's leading STI strategies and goals

China has implemented a range of innovation policies to support its goal of becoming a global leader in science and technology. Some of the key policies and initiatives are:

- **Made in China 2025:** This national plan to transform China into a high-tech manufacturing hub identifies ten key sectors, including aerospace, robotics, and biopharmaceuticals, in which China aims to be a world leader by 2025. The plan also includes initiatives to upgrade manufacturing capabilities and increase research and development spending.
- **National Medium- and Long-Term Plan for the Development of Science and Technology:** This is a strategic plan that sets out China's innovation priorities for the next 15 years. The plan includes targets for research and development spending, the number of patents filed, and the number of high-tech companies established.
- **1000 Talents Plan:** This is a program to attract top overseas talent to work in China. The program offers financial incentives, research funding, and other benefits to encourage high-level professionals to work in China.
- **National Innovation-Driven Development Strategy:** This strategy aims to make China an "innovation-oriented" country by 2020. The strategy includes measures to increase investment in science and technology, improve the innovation environment, and promote entrepreneurship.
- **China Innovation 2020:** This is a five-year plan to boost innovation in China. The plan includes

measures to increase funding for research and development, improve the intellectual property protection system, and encourage innovation in emerging industries.

- **The Belt and Road Initiative:** This is a development strategy to boost economic cooperation and connectivity between China and countries along the old Silk Road. The initiative includes measures to promote innovation and technology transfer.

Overall, China's innovation policies are aimed at promoting research and development, increasing investment in science and technology, and building a culture of innovation. These policies have contributed to China's rapid economic growth and the country's emergence as a major player in the global innovation landscape (Yu & Shan, 2018).

China's success in innovation and manufacturing can be attributed to a number of factors:

- **Government support:** The Chinese government has been a major driving force behind China's innovation and manufacturing success. The government has provided significant funding and support for research and development in key sectors, as well as offering tax breaks and other incentives to companies that invest in innovation.
- **Strong education system:** China has a strong education system that has produced a large pool of highly skilled and well-educated workers. This has helped to build a strong talent base for innovation and manufacturing.
- **Large domestic market:** China has a huge domestic market, which has provided a strong foundation for its manufacturing industry. This has enabled companies to achieve economies

of scale, which in turn has made it easier for them to invest in innovation and research and development.

- **Low labour costs:** China has traditionally had low labour costs, which has made it an attractive location for manufacturing. This has helped to fuel the growth of the manufacturing industry, which in turn has created opportunities for innovation.
- **Strong infrastructure:** China has made significant investments in infrastructure, including transportation and communications networks, which have helped to support the growth of its manufacturing and innovation industries.

China's success in innovation and manufacturing can be attributed to a combination of government support, a strong education system, a large domestic market, low labour costs, and strong infrastructure (Lu & Hsu, 2019).

The critical learning that emerges from the STI strategies of the above countries is the policy positioning responding to the priorities of the respective economies. The impact of the policy could be more strongly visualised in addressing some of the key pressing needs of the socio-economic-environmental urgencies of the economy. Thus, an evidence-based STI policy could also enable a strong impact-oriented outcome.

2.6. STATE-LEVEL SCENARIO

NITI Aayog and the Institute for Competitiveness have brought out the India Innovation Index (III) annually since 2019. The framework used for III is mapped with the GII indicators (Kapoor & Sinha, 2021). The III has two dimensions – enablers (measures the inputs) and performance (measures the output). Enabler has five pillars, viz, human capital, investment, knowledge workers, business environment, and safety and legal environment. Performance has knowledge output and knowledge diffusion as two pillars. Each pillar is further divided into specific indicators; III has 66 indicators in total.

The III covers all 28 States and 8 Union Territories in India. As states differ in their innovative capabilities as per demographic, socio-economic and cultural factors, they have been classified into three categories – Major States, North-east & Hill States and Union Territories & City States. The India Innovation Index assesses the states' performance based on relative performance rather than absolute scores. A state's strength and weakness are based on relative scores rather than absolute ones.

States have scored fairly high on some of the enablers, and the performing pillars have scored low, which means that the effectiveness of enablers (with an average score of 19.50) has not been reflected in the performing pillars (with an average score of 9.62). This implies that the enablers haven't been used optimally. The high performance of human capital in terms of school and tertiary education has not been reflected in the performer pillar's indicators like patents filed per unit Gross State Domestic Product (GSDP).

Amongst the 9 Union Territories and City-States, the average innovation score is 15.74, higher than the national average of 14.56. Chandigarh was the best performer, with a score of 27.88 and topped the overall rankings, followed by Delhi with a score of 27.00. Ladakh was at the bottom with a score of 5.91.

Among the 17 Major States, Karnataka, with a score of 18.01, is the top performer, followed by Telangana and Haryana. Chhattisgarh scored the least, 10.97. And the average score for the Major States category is 14.02.

The North-eastern and Hill States category comprises 10 states. The average score of this category is 14.41. At the top is Manipur, with a score of 19.37 and with a score of 11, and Nagaland at the bottom.

States with high GSDP tend to have high innovation scores. This might be because states with high GSDP invest more in innovation paradigms. This relationship was also evident at a country level. The GII 2022, indicates that countries with higher per capita GDP also invested more in R&D.

TABLE 2.9: Leading Performers in the Seven Pillars

Name of the Pillar	Minimum Score	Maximum Score	National Average Score	Top three States/UTs (Score)
Human Capital	12.06	36.80	25.60	Puducherry (36.80) Mizoram (35.23) Chandigarh (33.56)
Investment	0.00	19.06	6.26	Karnataka (19.06) Arunachal Pradesh (17.12) Manipur (11.44)
Business Environment	11.27	40.80	28.13	Uttar Pradesh (40.80) Delhi (39.28) Telangana (36.54)
Knowledge Workers	0.16	22.44	5.68	Chandigarh (22.44) Delhi (14.21) Manipur (12.78)
Safety and Legal Environment	10.97	73.13	31.84	Manipur (72.13) Meghalaya (64.44) Andaman and Nicobar Islands (60.50)
Knowledge Output	0.93	41.96	13.44	Chandigarh (41.96) Delhi (39.63) Telangana (19.61)
Knowledge Diffusion	0.00	16.28	5.81	Delhi (16.28) Chandigarh (13.34) Karnataka (11.79)

Source: Compiled from Kapoor and Sinha 2022

Human capital is the third highest performing pillar, after Safety and Legal Environment and Business Environment among the enablers. Twenty states have scores above the national average. In investment, which is essential for innovation in any state, the national average is very low. Karnataka is the leading state in this pillar primarily because of its performance in FDI inflows and venture capital deals. Uttar Pradesh has scored the highest in Business Environment due to improvement in the overall business environment, which is reflected in the ease of doing business score. The knowledge workers have the lowest score among all the seven pillars. In the safety and Legal Environment, the major states and the Union Territories/City states are the leading performers.

In the knowledge output, states with higher per capita GSDP tend to dominate. Apart from Chandigarh, Delhi and Telangana, economically prosperous states of Western and Southern India – Maharashtra, Karnataka and Tamil Nadu are the leading states. Knowledge diffusion captures the absorption capability of states.

2.7. LOCATION-SPECIFIC CHARACTERISTICS

The local character of innovation processes has perceived the region as a locus of innovation (Lalrindiki & Gorman, 2016). Spatial proximity is perceived as a competitive advantage.

In that, cities continue to be essentially hubs of innovation and improvements in individual and collective welfare (Glaeser, 2011). Physical proximity facilitates access to services such as health and education, while urban economies lead to increased productivity and rising

incomes. For producers, higher costs (rent, labour) are more than compensated by the value of increased output resulting from the availability of more skilled labour, more plentiful capital, and larger localised markets for their products (Quigley, 2008). This, along with the diversity of knowledge, cements their role.

The presence of India's leading institutions in cities (e.g., Indian Institute of Science (IISc), Indian Institutes of Management (IIMs), Indian Institutes of Technology (IITs)), tend to create conducive environments for innovation activities and act as fertile ground for attracting multinational corporations (MNCs), and act as corporate centres (corporate headquarters) impacting the innovation landscape. MNCs are often successful at leveraging knowledge-based and innovation advantages and act as crucial providers of both capital flows (via FDI) and new technologies (via alliances/collaborations and spill-overs) (Cantwell & Mudambi, 2005). Through effective policy mechanisms, cities are able to absorb knowledge and know-how from MNCs and to create a number of 'lead firms' capable of not only engaging and competing with leading firms elsewhere in the world, but also developing the all-important local networks through which knowledge and innovation are distributed within clusters and then diffused across different parts of the country (Yeung, 2007). With these key characteristics, large cities and trade entry points in China and India have become the gateways for diaspora migrants and trans-national communities, facilitating innovation, by spreading ideas, developing globalised production systems and influencing institutional reform in 'home' countries (Saxenian & Sabel, 2008, Saxenian, 2008).

The Global Innovation Index 2022 shows that Indian cities such as Delhi, Mumbai, Bengaluru and Chennai are now rated among the top 100 science and technology clusters in the world as shown in Table 2.10 (WIPO, 2022).

It can be said that national innovation strategies and policies, rapid urbanisation, and uneven institutional capacities across regions in India have coalesced to form innovation 'islands' in large urban areas.

TABLE 2.10: Science and Technology Clusters in India

Cluster name	Cluster rank	PCT* applications	Scientific publications	Share total PCT filings (%)	Share of total publications (%)	Total	Rank 2015-19	Rank change
Bengaluru	60	3,746	14,604	0.3	0.2	0.5	60	0
Delhi	64	1,046	28,440	0.1	0.4	0.5	66	2
Mumbai	84	1,481	15,671	0.1	0.2	0.4	87	3
Chennai	97	686	18,0984	0.1	0.3	0.3	99	2

*PCT is WIPO's Patent Cooperation Treaty Source: Global Innovation Index 2022, pp 258-259, (WIPO 2022)

A yellow industrial robotic arm is shown in a factory setting, positioned over a large, circular metal gear. The arm is yellow with black joints and is connected to a blue cable. The background is a blurred industrial environment with various machinery and structures. The entire image is overlaid with a semi-transparent blue and purple gradient. In the top right corner, there is a pattern of white circles of varying sizes. A vertical white line with a small white dot at the bottom is located on the left side of the image.

3

METHODOLOGY

METHODOLOGY

This chapter provides the survey methodology and analytical framework of the firm-level innovation survey component of the National Manufacturing Innovation Survey (NMIS) 2021-22. The NMIS 2021-22 Survey was conducted between February 2021 and May 2022 with an observation period from financial year 2017-18 to 2019-20, i.e., covering the three years from 1 April 2017 to 31 March 2020.

3.1 SURVEY METHODOLOGY

3.1.1 SAMPLING FRAME

The sampling frame for the NMIS 2021-22 survey was obtained from the Annual Survey of Industries (ASI) 2018-19 frame (MOSPI, 2020), the Centre for Monitoring Indian Economy's (CMIE) Prowess IQ database 2018-19 (CMIE, 2020) and the Department of Science and Technology's (DST) directory of R&D institutions 2018-19 (DST, 2018).

ASI is the principal source of industrial statistics in India, and it covers all registered manufacturing and repairing units (35 manufacturing and related services sectors as per 2-digit national industrial classification)

across all states and union territories of India, except the union territories of Lakshadweep and Ladakh. The CMIE database covers all active business entities (not restricted to only registered companies and includes business entities that are not mere registrations without any activity) in the country (including the union territory of Ladakh) across 57 manufacturing and related service sectors. The DST database covers firms from 28 states or UTs and 49 sectors as per the 2-digit national industrial classification from NIC 05 (mining of coal and lignite) to NIC 73 (advertising and market research).

Firms belonging to manufacturing and related services (59 sectors from NIC 05 to NIC 63; NIC 70 to NIC 74; and NIC 95) were compiled from the three databases to construct the sampling frame. Redundancies were removed from the sampling frame, that is, if a firm was present in more than one database, it was only considered once. After compiling the 3 databases with unique firms, geographically, the sampling frame (survey population) represented firms across 28 states and 7 UTs of India, except the union territory of Lakshadweep and 59 NIC sectors (see Table 3.1 for the population across the 3 databases).

TABLE 3.1: Population across databases

Database	Total firms	Firm level survey population
ASI	244,366	212,397
CMIE	47,823	34,110
DST	3,698	1,780
Total	295,887*	248,287**

*All sectors

**59 sectors related to manufacturing and associated services

3.1.2. SAMPLING METHOD

The sampling method used for the National Manufacturing Innovation Survey was stratified random sampling. The target population of manufacturing firms to be surveyed was broken down into similarly structured subgroups or strata, which are as homogeneous as possible, and form mutually exclusive groups. Appropriate stratification will normally give results with smaller sampling errors than a non-stratified sample of the same size and will make it possible to ensure that there are enough surveyed firms in each of the strata to produce results of acceptable statistical quality.

3.1.2.1. STRATIFIED RANDOM SAMPLING

The stratification variables used for the firm-level survey, i.e., the characteristics used to break down the sample into similarly structured groups, are the following:

- Location: the state in which the firm is registered has 36 units comprising the 28

states and 7 union territories of India, excluding Lakshadweep (see annexure table for the list of states and UTs in the population)

- Economic activity: sectors were selected as per the National Industrial Classification (NIC) 2008 at the two-digit level that belonged to **manufacturing and related services**:
 - 59 NIC sectors from the population were relevant to manufacturing and related services (see annexure table for the list of 59 NIC sectors in the population)
- Firm size was measured as per data availability (see annexure for the number of large, medium, small and micro firms in the population). Wherever possible, turnover and investment in plant and machinery or equipment^{25, 26}, as per the 2020 MSME definition, are used to calculate firm size as shown in Figure 3.1 (Ministry of Micro, Small and Medium Enterprises, 2020):

²⁵ The expression “plant and machinery or equipment” of the enterprise, shall have the same meaning as assigned to the plant and machinery in the Income Tax Rules, 1962 framed under the Income Tax Act, 1961 and shall include all tangible assets (other than land and building, furniture and fittings). Available at: https://msme.gov.in/sites/default/files/IndianGazette_0.pdf

²⁶ Data on turnover and investment in plant and machinery or equipment is inflation-adjusted using CPI26 with base year 2015. Investment in plant and machinery or equipment values are adjusted for depreciation by taking their net values.

FIGURE 3.1: Firm size classification

Turnover	≤ 5 cr	Large	Medium	Small	Micro
	≤ 50 cr	Large	Medium	Small	Small
	≤ 250 cr	Large	Medium	Medium	Medium
	> 250 cr	Large	Large	Large	Large
Firm size classification		> 50 cr	≤ 50 cr	≤ 10 cr	≤ 1 cr
Investment in plant and machinery or equipment					

Source: Ministry of Micro, Small and Medium Enterprises, 2020.

In case of missing turnover and investment in plant and machinery or equipment data, employment data was used as a proxy for firm size as per the criteria given below, and the firms were reclassified post the survey.

- Large – 200 + employees (Kapoor., 2016, p.11)²⁷
- Medium – 50 to 199 employees
- Small – 20 to 49 employees
- Micro – 0 to 19 employees (Kapoor., 2018, p.12)

Procedure:

- Firstly, the population in the ASI, CMIE and DST databases were organised into sectors as per 2-digit NIC 2008 classification across each state and union territory.
- Secondly, all the units were categorised into firm size bins based on available parameters as described earlier.
- Finally, units for the survey are selected through random sampling.

3.1.3. SAMPLE SIZE CALCULATION

- **Overall sample sizes** for both firm-level and sectorial system of innovation surveys are determined by the degree of stratification of the sample. The overall sample size depends on the decision of the sample size for each level of stratification.
- **Determining the desired sample size:** Desired sample size from a particular state, which will represent the population (total production units), is calculated through the formula developed by Cochran (1963).

$$SS = \frac{Z^2 * p * (1 - p)}{e^2}$$

Where:

Z = Z value (e.g., 1.96 for 95% confidence level)

p = percentage picking a choice, expressed as decimal (.5 used for sample size needed)

e = margin of error, expressed as decimal (e.g., .05 = ± 5%)

²⁷ Small firms are defined as those having less than 50 employees, medium firms have 50-199 employees and large firms as those having 200 or more workers.

- **Margin of error** – It is defined as the range of values below and above the sample statistic in a confidence interval. It is a measure of the variability of sample statistics, and it is used to indicate the level of precision of the sample estimate. It is typically expressed as a percentage of the total sample size and is calculated by taking the standard deviation of the sample and dividing it by the square root of the sample size. The margin of error for the sectorial survey sampling is $\pm 5\%$.
- **Confidence Level** – It is the proportion of the sample, which will represent the population, given the level of precision or confidence interval. A 95% level of confidence has been taken, which shows that 95 out of every 100 samples will have true population value within the level of precision.
- **Correction for Finite Population:** If the population is small, then the sample size can be reduced slightly. This is because a given sample size provides proportionately more information for a small population than for a large population. The sample size obtained for different states is based on the formula –

$$\text{New SS} = \frac{SS}{1 + \frac{SS - 1}{pop}}$$

Where: pop = is the number of production units in a state (finite population)

3.1.4. SAMPLE

The sampling process resulted in a stratified random sample of 10,139 firms across twenty-eight states and six union territories covering 57 sectors belonging to manufacturing and related

services as per the National Industrial Classification of 2008. Post sampling, Ladakh was excluded from the sample due to its negligible presence in the population resulting in a sample covering 28 states and 6 UTs (Lakshadweep was absent in population). Similarly, from the 59 NIC sectors in the population, only 57 NIC sectors remained in the sample as NIC 09 (Mining support service activities), and NIC 56 (Food and beverage service activities) were removed due to their low presence in the population.

3.1.5. RESPONSE RATE

An overall response rate of 80% was achieved at the national level with completed interviews of 8,087 firms. Annexure exhibits the state-wise (Table A.1) and sector-wise (Table A.2) distribution of firms across population, sample size, responses and response rate. Mizoram, Sikkim, Nagaland, Manipur, Meghalaya, Arunachal Pradesh and Tripura had less than 100 responses individually. They were clubbed together as North-eastern states (excluding Assam) for the purpose of analysis. Andaman and Nicobar Islands, with 12 responses and Ladakh, with a single response, were excluded from the analysis, resulting in 8,074 firms analysed across 28 states and 6 UTs. The response rate varied from 52% in Chandigarh to 114% in Maharashtra.

The highest number of responses were from Maharashtra, Dadra & Nagar Haveli and Daman & Diu, Gujarat, Andhra Pradesh, Rajasthan, Uttar Pradesh, Telangana, Tamil Nadu and West Bengal.

Dadra & Nagar Haveli and Daman & Diu were separate union territories during the survey sampling period and hence, were sampled separately.

During the sampling, each UT had a sample size of 296 and 311, respectively, at +/-5% margin of error and 95% confidence level derived from a population of 1,292 and 1,617 firms, respectively. On 26 January 2020, the union territories of Dadra & Nagar Haveli and Daman & Diu were merged to form a single union territory of Dadra & Nagar Haveli and Daman & Diu. Analysis was done both by keeping the union territories separate and after merging them. In the first case, Dadra & Nagar Haveli was ranked second and Daman & Diu third, whereas in the second case, the union territory of Dadra & Nagar Haveli and Daman & Diu was ranked second in the Indian Manufacturing Innovation Index. The latter has been presented in the results.

As shown in the annexure, out of the 59 NIC sectors, extraction of crude petroleum and natural gas (06), water transport (50), and postal and courier activities (53) had no responses. While Mining support service activities (09) and

Food and beverage service activities (56) were removed from the sample owing to the low presence in the population, they had 1 response each. For the purpose of analysis, the remaining 54 sectors were grouped into 33 sectors (groups sectors are marked in distinct colours in Table 2 in the annexure) based on their similarity. However, out of these 33 groups, only 17 sector groups (see sector responses marked in green in Table A.2 in the annexure) had at least 100 responses and were considered for the analysis. These 17 sectors account for 7,364 responses, that is, 91% of the total firms surveyed.

Figure 3.2 shows responses by firm size. Fifty-two percentage of the responses were from micro firms, followed by 29%, 13% and 6%, respectively, from small, medium and large firms. Table 3.2 presents the population, sample size, number of responses and response rate across firm sizes. Micro firms had the highest response rate (97%) and medium-sized firms had the lowest response rate (47%).

FIGURE 3.2: Share of responses across firm sizes

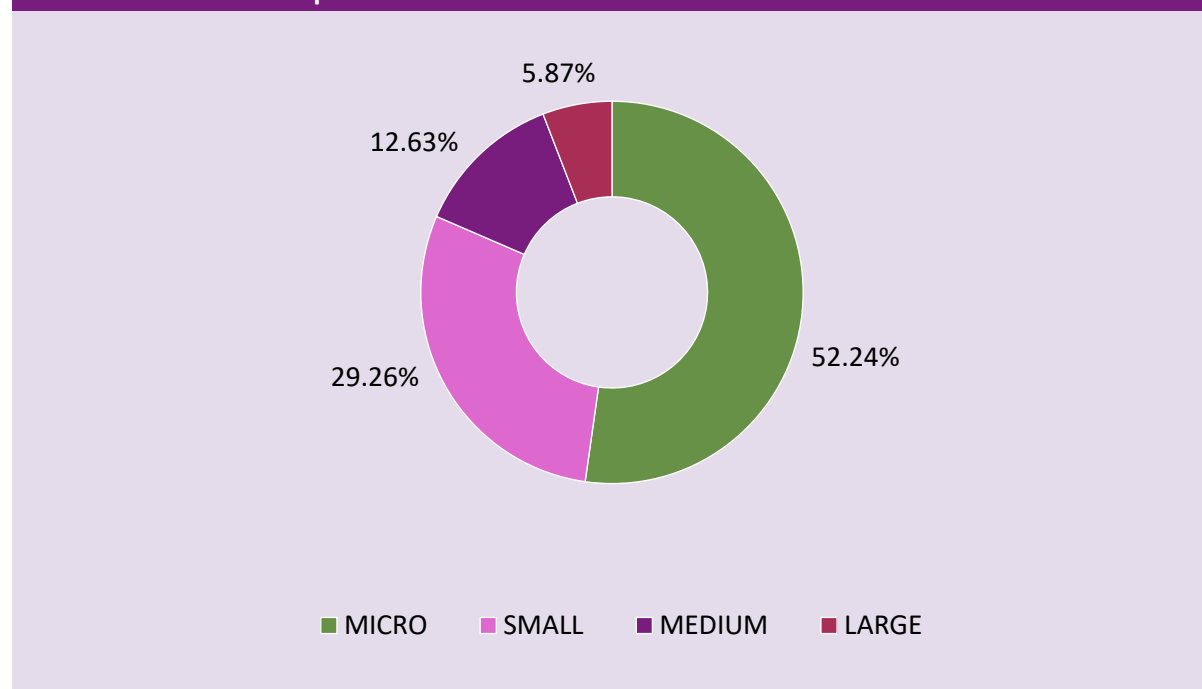


TABLE 3.2: Size wise distribution of sample and responses

Size bin	Population	Sample	Response	Response rate
Micro	103580	4347	4225	97%
Small	69902	2758	2366	86%
Medium	52120	2181	1021	47%
Large	22686	852	475	56%
Total	248287	10139	8087	80%

3.1.6. LIMITATIONS

- The data collection was impacted by COVID-19 since many businesses were closed. This has affected the survey response rate to some extent, with an all-India response rate of 80%.
- The classification of firms into large, medium, small and micro is only a rough estimate given that the universe is a combination of 3 databases with the absence of similar parameters to measure firm size. Given that the size reclassification is conducted post the survey based on self-reported turnover and investment in plant and machinery or equipment, a reporting bias is expected.

3.2. ANALYTICAL FRAMEWORK

The results of the firm-level component of the National Manufacturing Innovation Survey were used to construct the Indian Manufacturing Innovation Index (IMII) 2022 for a state-wise comparison of innovation indicators, pillars and

dimensions. The index captures the current scenario of firm-level innovation in manufacturing and related services sectors across states or UTs. In other words, it captures the actual innovations that had been implemented by firms during the three-year assessment period (financial year 2017-18 to 2019-20). The index studies the achievements, incentives and challenges encountered by firms in implementing innovations in their products, services and business processes. In addition, innovation outcomes and objectives and their innovation activities and inputs that contributed thereto, were analysed. The index provides a comprehensive framework to aggregate firm-level data on innovation performance from 8,074 manufacturing firms²⁸ by state/UT to compare their performance.

In addition to the index construction at the state level, this report also compares sector and size-specific innovation activities and investment, capabilities, linkages and knowledge flows, innovation outputs, outcomes, objectives and barriers of manufacturing firms. Due to

²⁸ Firms from Andaman and Nicobar Islands (12) and Ladakh (1) were excluded from the index construction given the low number of survey responses. North-eastern states excluding Assam have been clubbed together in view of low number of completed surveys by state.

limitations in the availability of responses, as described in the response rate section earlier, sector-level analysis is restricted to 17 sector groups with at least 100 responses.

The firm-level innovation survey questionnaire was designed based on the Oslo Manual framework (2018) in alignment with the manufacturing context in India through consultations with the Department of Science and Technology's Technical Advisory Committee. The firm-level component of the survey has 54 questions (see questionnaire in the annexure) covering innovation inputs as presence of enablers and absence of barriers and innovation outputs and outcomes in the form of innovation performance.

All the indicators of the index are derived from the 54 questions to measure the internal capabilities of firms as well as the external enabling environment (innovation linkages and knowledge flows) that promotes innovation.

3.2.1. ENABLERS (PRESENCE), BARRIERS (ABSENCE) AND PERFORMANCE

ENABLERS

Enablers comprise the pillars that steer firm-level innovation in manufacturing in a state. The 'Enabler' dimension has three pillars, namely, 'Innovation Activity and Investment', 'Innovation Capabilities' and 'Innovation Linkages and Knowledge Flows'. The indicators under these pillars depict the enabling environment for firm-level innovation in manufacturing.

The capacity of each state to enable innovation in manufacturing is measured through these

three pillars. This allows the understanding of how the innovation activities, internal firm capabilities and enabling ecosystems of best-performing states are thriving and helps generate best practices and customise innovation paths for low performers.

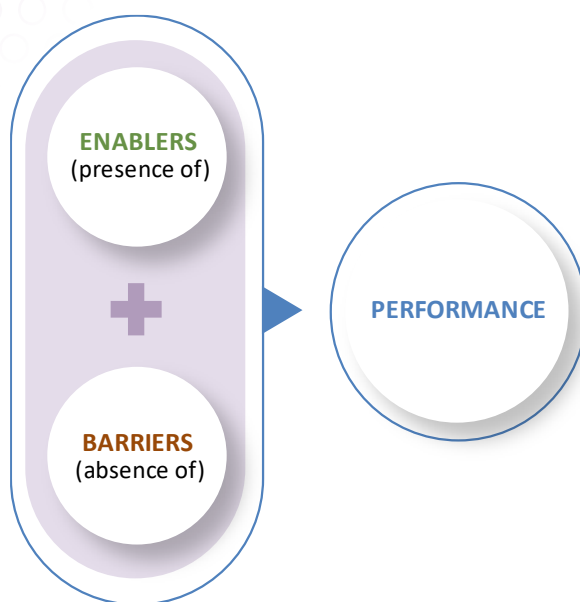
BARRIERS

The dimension 'Barriers' measures the challenges faced by firms while implementing innovation input activities. For the index construction, barrier indicators have been transformed such that the impact of all indicators on the index is positive. Indicators in the 'Barrier' dimension depicts the absence of barriers while innovating. Data has been transformed such that the impact of all indicators on the index is positive. For instance, in Chapter 4 for the index construction, all 21 indicators under the 'Barrier' dimension measure the share of firms that reported *no impact* of those barriers on their innovation activities. In chapter 7, however, where Barriers are discussed at the indicator level, the presence of barriers across states, sectors and firm sizes is analysed.

PERFORMANCE

Performance is measured through the output variables under innovation incidence and characteristics and objectives and outcomes that cover the occurrence of different types of innovation, their nature and the objectives and outcomes of these innovations. Performance results in competitiveness, productivity and knowledge creation. Together, the presence of enablers and the absence of barriers lead to innovation performance among firms, as represented in Figure 3.3.

FIGURE 3.3: Innovation enablers (presence), barriers (absence) and performance



The Indian Manufacturing Innovation Index 2022 constructed from the results of NMIS 2021-22 has 3 dimensions, 9 pillars and 80 indicators. Table 3.3 lists the dimensions, pillars and

number of indicators under each dimension and pillar. Table 3.4 provides the list of the 80 indicators used in the index construction.

TABLE 3.3: Composition of the Indian Manufacturing Innovation Index (IMII) 2022

	DIMENSION	PILLAR	INDICATORS	TOTAL
INPUT	ENABLERS (presence of)	Innovation Activity and Investment	4	30
		Innovation Capabilities	11	
		Innovation Linkages & Knowledge Flows (Enabling Environment)	15	
	BARRIERS (absence of)	Potential & Capabilities Barriers	6	21
		Financial Barriers	4	
		Policy Barriers	3	
		Market & Linkage Barriers	8	
OUTPUT	PERFORMANCE	Innovation Incidence & Characteristics	10	29
		Innovation Objectives and Outcomes	19	
	TOTAL	9	80	

TABLE 3.4: Indicators across dimensions and pillars

DIMENSIONS	INDICATORS (share of firms in %)
ENABLERS (PRESENCE)	Pillar 1: Innovation Activities and Investment
	Share of firms that engaged in tangible activities for innovation
	Share of firms that engaged in knowledge-based capital (KBC) or intangible activities for innovation
	Share of firms that invested in tangible activities for innovation
	Share of firms that invested in KBC or intangible activities for innovation
	Pillar 2: Innovation Capabilities
	Share of firms with internal sources of financing available for innovation activities
	Share of firms that used innovative tools and practices among staff that are successful
	Share of firms highly satisfied with innovation capabilities of employees
	Share of firms that made use of internal information sources for innovation
	Share of firms that used advanced, enabling or emerging technologies
	Share of firms with an R&D strategy
	Share of firms that employed highly qualified personnel, by level of educational attainment
	Share of firms with R&D staff
	Share of firms that employed experts in Industry 4.0 and advanced digital tools ²⁹ in house
	Share of firms with an I4.0 strategy
	Share of firms with internal funding available for training
	Pillar 3: Innovation Linkages & Knowledge Flows
	Share of firms highly satisfied with investment climate in the state
	Share of firms highly satisfied with ease of doing business in the state
	Share of firms highly satisfied with govt. support for enabling innovation
	Share of firms highly satisfied with innovation infrastructure in the state
	Share of firms highly satisfied with innovation capabilities of external talent pool
	Share of firms with formal cooperation agreements for innovation
	Share of firms that engaged experts in Industry 4.0 and advanced digital tools ³⁰ from external sources
	Share of firms that exported to international markets
	Share of firms that imported from international markets
	Share of firms with informal cooperation for innovation
	Share of firms that collaborated with Indian entities on innovation activities
	Share of firms that collaborated with foreign entities on innovation activities

²⁹ engineering or applied sciences/ mathematics or statistics or database management/ design of products/ software development/ multimedia/ web design/ market research/ graphic arts/ layout/ advertising.

³⁰ engineering or applied sciences/ mathematics or statistics or database management/ design of products/ software development/ multimedia/ web design/ market research/ graphic arts/ layout/ advertising.

BARRIERS (ABSENCE)	Share of firms making use of external information sources for innovation
	Share of firms with external sources of financing for innovation activities
	Share of firms with external funding available for training
	Pillar 4: Potential & Capabilities Barriers (absence)
	Share of firms that reported no impact of insufficient innovation capability (R&D, design, etc.) on innovation activities
	Share of firms that reported no impact of organizational rigidities (inflexibility) within the firm on innovation activities
	Share of firms that reported no impact of lack of need due to prior innovations by the firm on innovation activities
	Share of firms that reported no impact of lack of qualified personnel on innovation activities
	Share of firms that reported no impact of lack of good ideas for innovations on innovation activities
	Share of firms that reported no impact of lack of firm-level infrastructure on innovation activities
	Pillar 5: Financing Barriers (absence)
	Share of firms that reported no impact of lack of funds within the firm or group on innovation activities
	Share of firms that reported no impact of lack of finance from sources outside the firm (credit) on innovation activities
	Share of firms that reported no impact of excessive perceived risks on innovation activities
	Share of firms that reported no impact of innovation costs too high on innovation activities
	Pillar 6: Policy Barriers (absence)
	Share of firms that reported no impact of regulations, standards, and taxation in hampering innovation activities
	Share of firms that reported no impact of weakness in protection, acquisition and/or utilization of intellectual property rights on innovation activities
	Share of firms that reported no impact of legislative barriers on innovation activities
	Pillar 7: Market & Linkage Barriers (absence)
	Share of firms that reported no impact of lack of information on markets on innovation activities
	Share of firms that reported no impact of deficiencies in the availability of external services on innovation activities
	Share of firms that reported no impact of difficulty in finding cooperation partners on innovation activities
	Share of firms that reported no impact of lack of information on technology on innovation activities
	Share of firms that reported no impact of market dominance by established firms on innovation activities
	Share of firms that reported no impact on innovation activities because of lack of incentive to innovate due to very little competition in firm's market
	Share of firms that reported no impact of uncertain demand for innovative goods or services on innovation activities
	Share of firms that reported no impact of low demand for innovations in the market on innovation activities

PERFORMANCE

Pillar 8: Innovation Incidence & Characteristics

- Share of firms with new or significantly improved goods
- Share of firms with new or significantly improved services
- Share of firms into innovations in operations and product/process development
- Share of firms into innovations in marketing and sales
- Share of firms into innovations in procurement, logistics, and distribution
- Share of firms into innovations in administration and management
- Share of product innovators that reported new-to-market (NTM) innovations
- Share of business process innovators that reported NTM innovations
- Share of firms that reported in-house product innovations
- Share of firms that reported in-house business process innovations (BPI)

Pillar 9: Innovation Objectives & Outcomes**Innovation Objectives**

- Share of firms that reported innovation objective of increasing their turnover
- Share of firms that reported innovation objective of increasing their market presence
- Share of firms that reported innovation objective of enhancing product/process in terms of quality and quantity
- Share of firms that reported innovation objective of reducing environmental impacts
- Share of firms that reported innovation objective of reducing costs
- Share of firms that reported innovation objective of improving health and safety of their employees
- Share of firms that reported innovation objective of meeting regulatory requirements (e.g. standards, etc.)
- Share of firms that reported innovation objective of catering to Corporate Social Responsibility

Innovation Outcomes

- Share of firms that reported improvement in their firm's turnover as a result of innovations
- Share of firms that reported opening up of new market opportunities as a result of innovations
- Share of firms that were able to respond to market pressures as a result of innovations
- Share of firms that were able to respond to cost pressures as a result of innovations
- Share of firms that were able to respond to existing or forthcoming regulatory provisions as a result of innovations
- Share of firms that attained any of the above innovation outcomes through I4.0 technologies
- Share of firms that were granted IP rights
- Share of firms that reported turnover from new-to-market product innovations
- Share of firms that reported turnover from NTM business process innovations
- Employment in innovative firms (as a percentage of total employment)

3.2.2 INDICATOR VALIDATION

The indicators have been selected such that they best represent their respective pillar. They have been grouped based on their interrelation through factor analysis. A reliability test for each pillar is conducted to evaluate the fit between indicators using Cronbach's alpha value

(Cronbach, 1951), (George & Mallery, 2003)³¹. An alpha value of > 0.7 for each pillar is acceptable, that is, the indicators in that pillar are closely related and are consistently measuring the same entity, and hence, they can be grouped together in the factor analysis. Table 3.5 shows the alpha values of each pillar. All values are above 0.7 and hence, are acceptable.

TABLE 3.5: Reliability values across pillars

DIMENSION	PILLAR	ALPHA
ENABLERS	Innovation Activity and Investment	0.872
	Innovation Capabilities	0.953
	Innovation Linkages & Knowledge Flows	0.933
PERFORMANCE	Innovation Incidence & Characteristics	0.709
	Innovation Objectives and Outcomes	0.861
BARRIERS	Potential & Capabilities	0.981
	Financing	0.980
	Policy	0.798
	Market & Linkages	0.981

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy evaluates the fitness of the data to run a factor analysis. It measures sampling adequacy³², both overall and for each variable (Kaiser, 1970), (Cerny & Kaiser, 1977), (Dziuban & Shirkey, 1974). The KMO index

ranges from 0 to 1, as a rule of thumb, KMO scores should be above 0.5 (Williams, et al., 2010). Table 3.6 shows the KMO values across pillars. The model is fit given that all pillars have KMO values above 0.5.

³¹ Alpha values measure the internal consistency of a test or scale ranging from 0 to 1 (Cronbach, 1951). Internal consistency refers to the extent that all items on a scale or test contribute positively towards measuring the same construct. Internal consistency can be employed for research or examination purposes to ensure validity. George and Mallery (2003) suggest a tiered approach consisting of the following: " $\geq .9$ – Excellent, $\geq .8$ – Good, $\geq .7$ – Acceptable, $\geq .6$ – Questionable, $\geq .5$ – Poor, and $\leq .5$ – Unacceptable" (p. 231).

³² The KMO measure looks at how well the data points in a study are related to each other. If the data points are strongly related to each other, then the KMO measure will be high, indicating that factor analysis is a good way to analyze the data. If the data points are not strongly related to each other, then the KMO measure will be low, indicating that other methods might be better.

TABLE 3.6: Kaiser-Meyer-Olkin test for sampling adequacy

DIMENSION	PILLAR	KMO
ENABLERS	Innovation Activity and Investment	0.588
	Innovation Capabilities	0.791
	Innovation Linkages & Knowledge Flows	0.797
PERFORMANCE	Innovation Incidence & Characteristics	0.636
	Innovation Objectives and Outcomes	0.782
BARRIERS	Potential & Capabilities	0.888
	Financing	0.720
	Policy	0.596
	Market & Linkages	0.884

3.2.3 WEIGHTAGE & SCORE CALCULATION

1. Pillar score = $\sum (\text{weightage} * \text{indicator } i)$

i – each indicator under the pillar

The weightage of each indicator was calculated by running a Principal Component Analysis³³ of each pillar. Three steps are followed to calculate the weightage for each indicator through this PCA (OECD, 2008). See the annexure for the calculated weightage for each indicator.

- **Step 1.** Calculate Normalized squared principal components loading of each variable.

Normalized squared principal component of variable i

$$= \frac{(\text{Principal component of variable } i)^2}{\text{Variance explained by } j^{\text{th}} \text{ principal component}}$$

where i = indicators; j = principal component in which indicator i loads

* The numerator, principal component of variable is from the rotated component matrix (principal components with values > 0.50 are retained)

- **Step 2.** Calculate the proportion of variance explained by each principal component

Proportion of variance explained by the j^{th} principal component

$$= \frac{\text{Variance explained by } j^{\text{th}} \text{ principal component}^*}{\text{Total variance explained by all principal components}}$$

³³ Source: Organization for Economic Co-operation and Development (OECD). (2008). Handbook on Constructing Composite Indicators: Methodology and User Guide. <http://www.oecd.org/std/42495745.pdf>

where j = principal component in which indicator i loads

*Variance explained by the principal component in the rotation sums of square loadings

- **Step 3.** Calculate weightage for each variable by multiplying the results of step 1 and step 2, that is, the normalised squared principal component loading of each variable (step 1) is multiplied with the corresponding principal component weight (step 2)

Weightage of variable i

$$= \text{Principal component weight of } j^{\text{th}} \text{ principal component} \\ \times \text{Normalized squared principal component loading of variable } i$$

where i = indicators; j = principal component in which indicator i loads

Note: To preserve comparability, final weights are rescaled to sum up to one.

$$2. \text{ Dimension} = \frac{(\sum \text{Pillar}_i)}{n}$$

i – each pillar score under the dimension; n – number of pillars in the dimension.

Dimension scores are the average of respective pillar scores.

3. The overall innovation score is the average of Enabler, Performance and Barriers scores, that is, equal weightage given to the three dimensions while calculating the IMII score.

3.2.4 CATEGORISATION OF STATES FOR RANKING

The innovation capability of manufacturing firms across states depends on various macro-economic and social factors at the state level such as population, geographical size, natural resources, policies, language and cultural nuances. Each state or union territory in India is different in terms of its socioeconomic and cultural setup and comparing all states on the same pedestal would lead to bias. Hence, states and union territories are classified into three groups, as shown in Table 3.7: Major (larger) states; Hill states; and UT or City states. This

classification is in line with the India Innovation Index state categorisation by NITI Aayog.

Seventeen states are grouped together in the Major states category owing to their size in terms of territory, population and economy, and by and large lower lying land. In the UT or city states category are Chandigarh, Dadra & Nagar Haveli & Daman & Diu, Goa, Jammu & Kashmir, New Delhi and Puducherry. Due to their geographical similarities, Assam, 7 North-eastern states³⁴ (owing to low responses), Himachal Pradesh and Uttarakhand are grouped under the Hill states category.

³⁴ Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura are clubbed together as “North-eastern states (excl. Assam)” owing to their individual low number of responses.

TABLE 3.7: Grouping of states

MAJOR STATES	UT & CITY STATES	HILL STATES
ANDHRA PRADESH	CHANDIGARH	ASSAM
BIHAR	DADRA & NAGAR HAVELI & DAMAN & DIU	HIMACHAL PRADESH
CHHATTISGARH	GOA	NORTH-EASTERN STATES (EXCL. ASSAM) (7 states) ³⁵
GUJARAT	JAMMU & KASHMIR	UTTARAKHAND
HARYANA	NEW DELHI	
JHARKHAND	PUDUCHERRY	
KARNATAKA		
KERALA		
MADHYA PRADESH		
MAHARASHTRA		
ODISHA		
PUNJAB		
RAJASTHAN		
TAMIL NADU		
TELANGANA		
UTTAR PRADESH		
WEST BENGAL		

³⁵ Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura

A worker wearing a yellow hard hat and safety glasses is looking at a laptop. The laptop screen displays various industrial data visualizations, including a bar chart, a line graph, and a robotic arm. The background is a blue gradient with a pattern of white circles.

4

INDIAN MANUFACTURING INNOVATION INDEX 2022

INDIAN MANUFACTURING INNOVATION INDEX 2022

4

This chapter summarises the findings of the firm-level manufacturing innovation survey on the Indian Manufacturing Innovation Index (IMII) 2022. It analyses in detail the all-India and state-wise scores of the IMII at the dimension and pillar levels. The chapter offers a detailed comparison of the IMII scores at the dimension and pillar levels across states. The three dimensions are enablers (presence of innovation input activities, internal firm capabilities and linkages and knowledge flows in the innovation ecosystem), absence of barriers (related to potential & capabilities, financing, policy, and market and linkages) and performance (objectives, outputs, and outcomes).

Furthermore, the chapter delves into the correlations between the three dimensions of the IMII, providing an in-depth understanding of the relationship between these dimensions. Additionally, the chapter examines the correlation between the per capita Gross State Domestic Product (GSDP) of Indian states and the IMII scores, to explore the potential impact of economic growth on innovation in the manufacturing sector. The chapter provides an in-depth understanding of the Indian manufacturing innovation landscape, providing

valuable insights for stakeholders in the manufacturing sector.

Figure 4.1 shows the scores of the Indian Manufacturing Innovation Index (IMII) and its three dimensions: Enablers (presence), Barriers (absence), and Performance. The Barrier (absence) score represents the share of firms that reported no impact of barriers on innovation input activities.

The Indian manufacturing sector has an overall score of 28.1736 on the Indian Manufacturing Index, an average of scores of the three dimensions across all states and UTs. The Enablers (presence) dimension has a national score of 20.52, the Barriers (absence) dimension has a national score of 38.31, and the Performance dimension has a national score of 25.68.

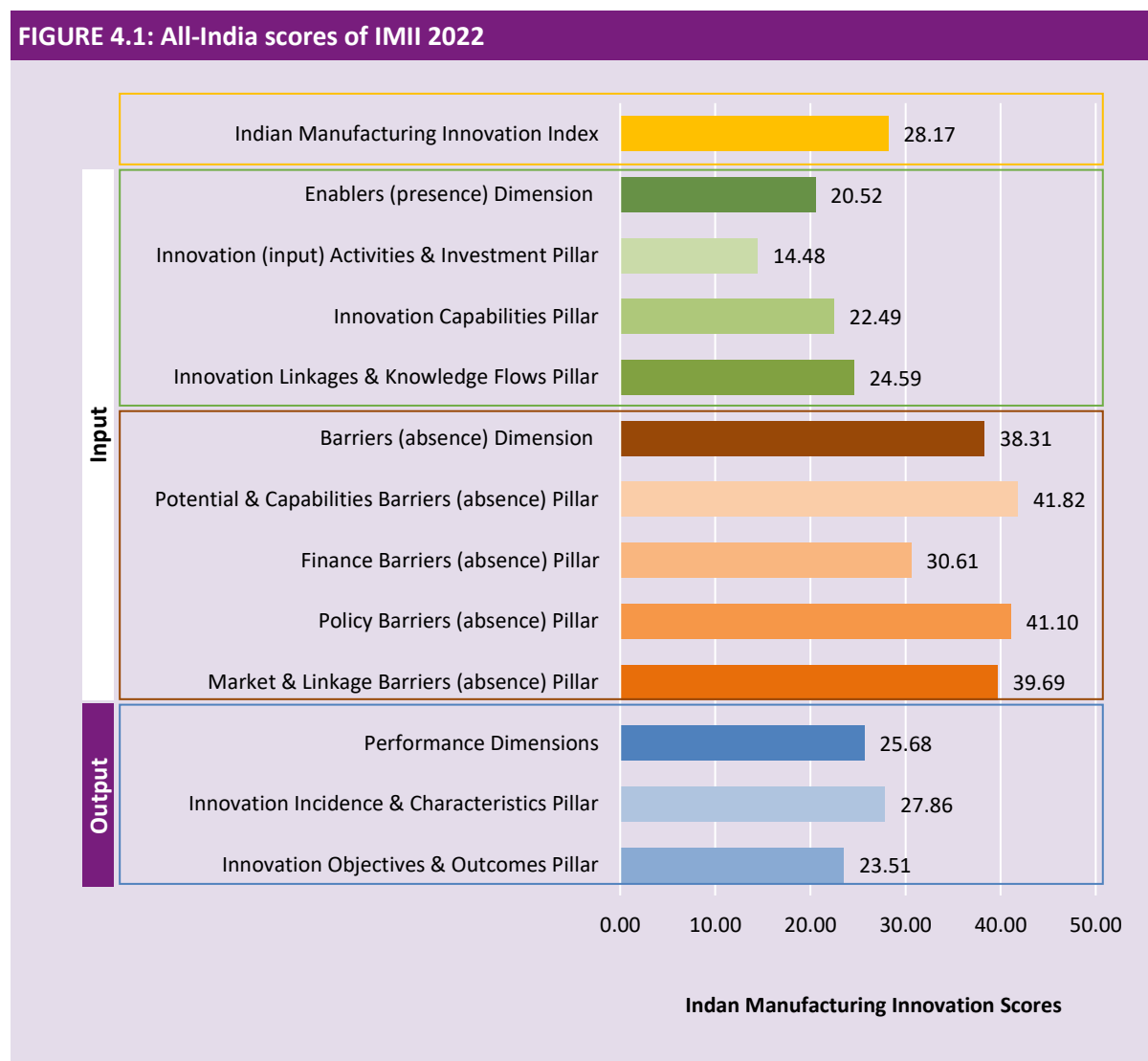
The Enablers dimension score is based on the share of firms that reported the presence of enabler indicators (see methodology for list of enabler indicators). This dimension consists of three pillars: innovation input activity and investment (score of 14.48), innovation capabilities (score of 22.49), and innovation linkages and knowledge flows (score of 24.59).

³⁶ The indicator scores used to construct the pillar and dimension scores are in percentage, that is, between 0 and 100. The pillar and dimension scores are presented without normalisation as it retains the original value and scale of the scores, allowing for a more accurate representation of the data. This approach can also help to avoid the limitations and biases that may come with normalisation. Instead of converting the scores to a common scale, we use benchmarking and ranking to make meaningful comparisons between the states.

The Barriers (absence) dimension score represents the share of firms that reported no impact of barriers (see methodology for list of barrier indicators) on their innovation input activities. This dimension constitutes four pillars: Potential and capability barriers (absence) (score of 41.82), financing barriers (absence) (score of 30.61), policy barriers (absence) (score of 41.10), and market and linkage barriers (absence) (score of 39.69).

The Performance dimension score is based on the share of firms that reported performance indicators (see methodology for list of performance indicators). This dimension has two pillars: innovation incidence and characteristics (score of 27.86) and innovation objectives and outcomes (score of 23.51).

FIGURE 4.1: All-India scores of IMII 2022



Innovation enablers has the lowest all-India score (20.52) among the three dimensions indicating a relatively low share of firms reporting the presence of enablers in Indian

manufacturing, as discussed in Chapter 5. While innovation capabilities within firms (22.49) and innovation linkages and knowledge flows (24.59) have relatively higher scores, the lowest score in

terms of the enabling environment is in engagement or investment in innovation input activities (14.48).

While the barriers (absence) pillar scores are above the overall IMII score, a majority of manufacturing firms in India are still facing critical barriers across the four pillars. Among the barrier (absence) pillar scores, the lowest score is for financing (absence), indicating that most firms reported accessing financing as a barrier for innovation input activities in manufacturing. A higher share of firms experiencing financing as a barrier explains the relatively low share of firms that invested in innovation input activities (see further analysis in Chapter 5).

The highest barrier (absence) pillar scores are for Potential and capability barriers (absence) at 41.82, followed by policy barriers (absence) at 41.10 and market and linkages (absence) at 39.69. This result is in alignment with the relatively high enabler (presence) scores for innovation capabilities within firms (22.49) and innovation linkages and knowledge flows (24.59).

The Performance dimension has a score of 25.68, indicating that a moderate share of firms is reporting the occurrence of innovation with specific innovation objectives and achieved outcomes.

Overall, across all states, performance scores are higher than enabler scores, indicating that their innovation outputs and outcomes exceed innovation inputs. However, this has to be understood, keeping in mind that the same

enablers might lead to multiple performance outcomes. In addition, pre-observation period innovation input activities, which are not counted as enablers in the observation period for this innovation survey, might have resulted in innovation outputs and outcomes during the observation period. Likewise, some enablers in the current observation period might result in innovation performance post the observation period.

Figure 4.1 also shows that Barriers (absence) has the highest score among all the three dimensions. This is primarily due to the low enabler scores. Firms were asked to report barriers they face while engaging in innovation input activities measured under enablers. Given the low number of firms undertaking innovation input activities, as reflected in the low innovation activity and investment scores, most firms appear not to have entered the stage where barriers to innovation input activities are manifesting and hence have reported fewer barriers, resulting in the higher Barriers (absence) scores.

Some barriers may also result in enablers to counter or circumvent the barrier. For instance, if a firm faces financing as a barrier, it might look for collaboration or less investment intensive innovation input alternatives (as discussed in Chapter 5); if a firm faces capabilities as a barrier, it might invest more into collaboration or other activities (as discussed in Chapter 5) thereby increasing enablers as well. However, given that the absence of barriers is generally high except in the case of financing, the ability of other barriers to impact or drive enablers seems to be low.

4.1 CORRELATION BETWEEN ENABLERS (PRESENCE), BARRIERS (ABSENCE) AND PERFORMANCE

The correlation between Enablers (presence), Barriers (absence), and Performance scores depicted in Figure 4.2, 4.3, 4.4, suggests that the presence of enablers (such as government support and access to market information) is positively associated with both lower barriers (such as lack of access to financing) and higher innovation output and outcomes (performance).

This correlation can be interpreted in a few ways:

- Firms that engaged in innovation activities (enablers) encountered fewer barriers and got rewarded for their endeavours in the form of higher innovation performance.
- The presence of enablers may help firms to overcome barriers and achieve better performance.
- The absence of barriers may be a contributing factor to the presence of enablers, thus, better performance.
- Firms already performing well may have more resources to invest in creating enablers and reducing barriers.

This relationship between enablers, barriers, and performance suggests that efforts to increase the presence of enablers, such as providing access to government support and

market information, as well as reducing barriers, such as lack of financing, may help to improve innovation performance in the manufacturing sector in India. The relationship was tested with a multiple linear regression analysis between the dependent variable (performance) and the two independent variables (enablers and barriers (absence)) to determine the strength of that relationship.

- The adjusted R-squared value of 0.7655 indicates that 76.55% of the variance in the dependent variable (performance) can be explained by the independent variables (enablers and barriers (absence)). This relatively high value suggests that the model is a good fit for the data.
- The standard error of 1.81 is a measure of the model's accuracy. A lower value indicates that the model is a better fit for the data.
- The coefficients for the independent variables (enablers and barriers (absence)) represent the change in the dependent variable (performance) for a one-unit increase in the independent variable, while holding the other variable constant. The coefficient for enablers is 0.6780, and the coefficient for barriers (absence) is 0.0249. This suggests that for a one-unit increase in enablers, the performance score increases by 0.6780; for a one-unit increase in barriers (absence), the performance score increases by 0.0249.

FIGURE 4.2: Enablers (presence) versus barriers (absence) dimension scores across states

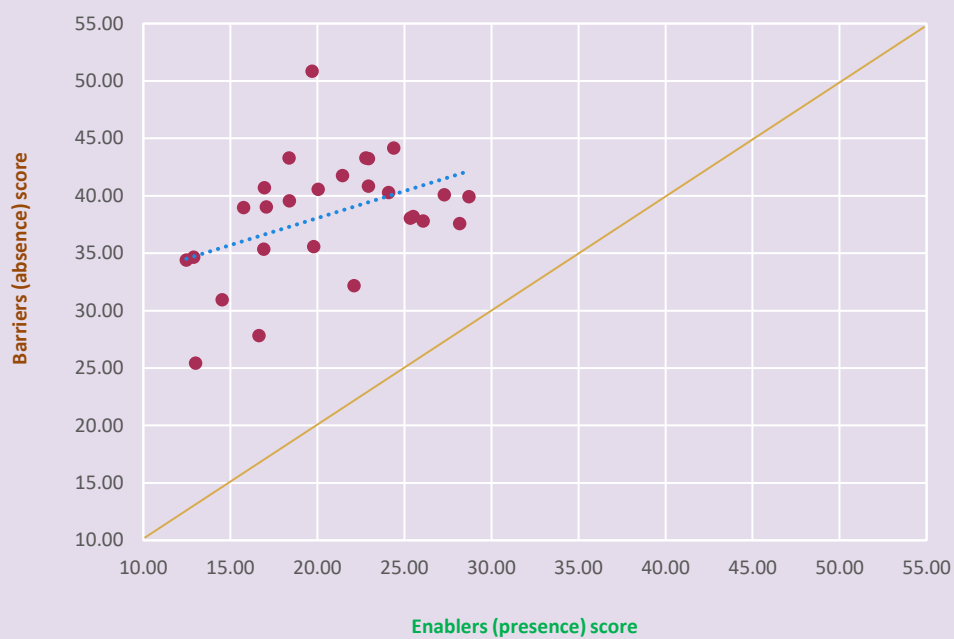


FIGURE 4.3: Enablers (presence) versus performance dimension scores across states

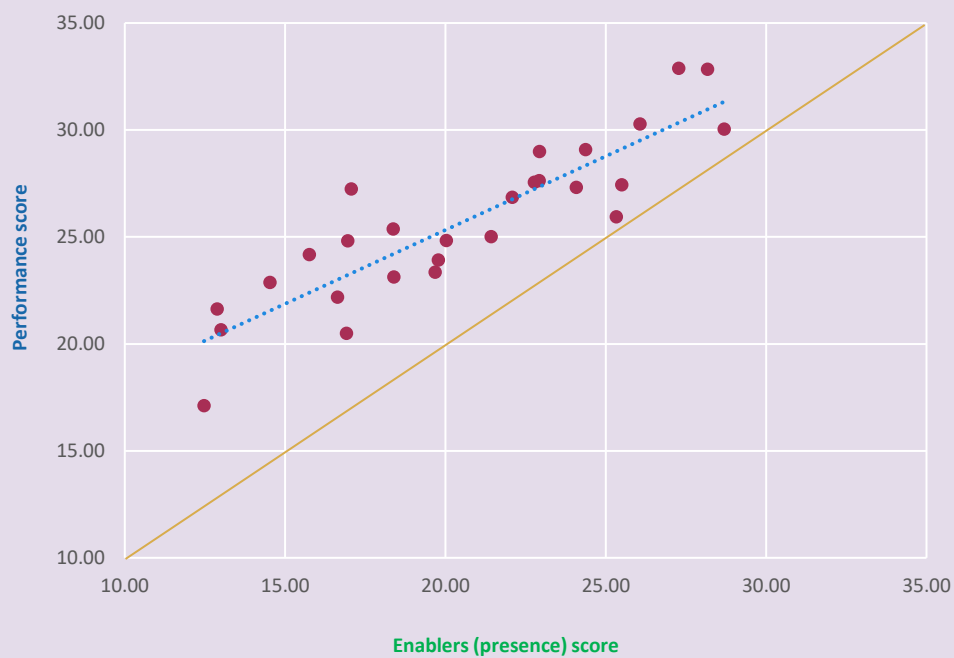
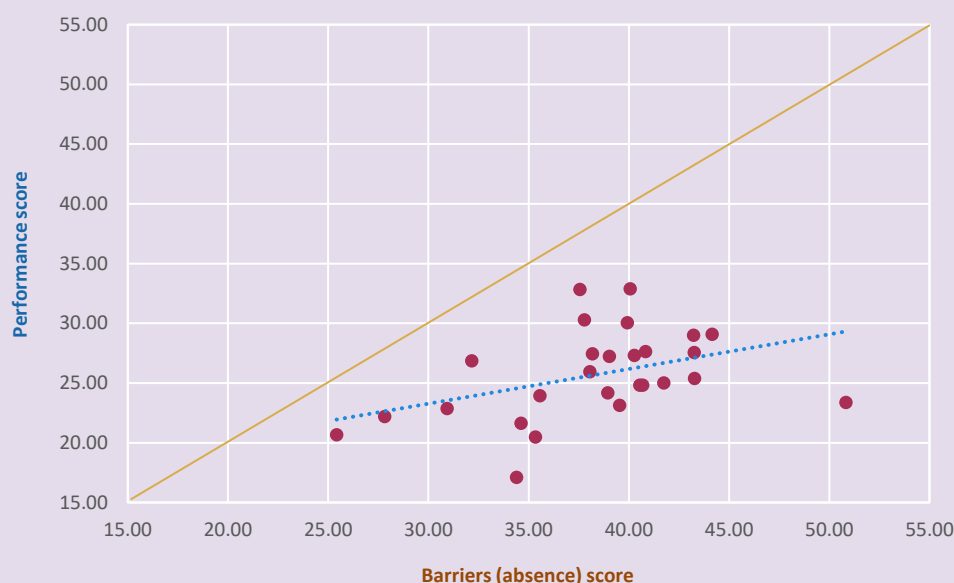


FIGURE 4.4: Barriers (absence) versus performance dimension scores across states


4.2 CORRELATION BETWEEN GSDP PER CAPITA AND IMII SCORE

Gross State Domestic Product (GSDP) per capita (2019-20) at constant (2011-12) prices (GoI, 2022) and the Indian Manufacturing Innovation Index display a positive correlation. Figure 4.5 plots the state's per capita GSDP against their IMII scores. A positive correlation coefficient (0.528) with a low p-value (0.006) and moderate adjusted R-square (0.248) suggests that there is a statistically significant and positive relationship between GSDP per capita and Indian manufacturing innovation scores across states, in other words, the higher the GSDP per capita is in a state, the higher its Indian manufacturing innovation score.

However, the adjusted R-square of 0.248 indicates that only 24.8% of the variation in Indian manufacturing innovation score can be explained by the variation in GSDP per capita,

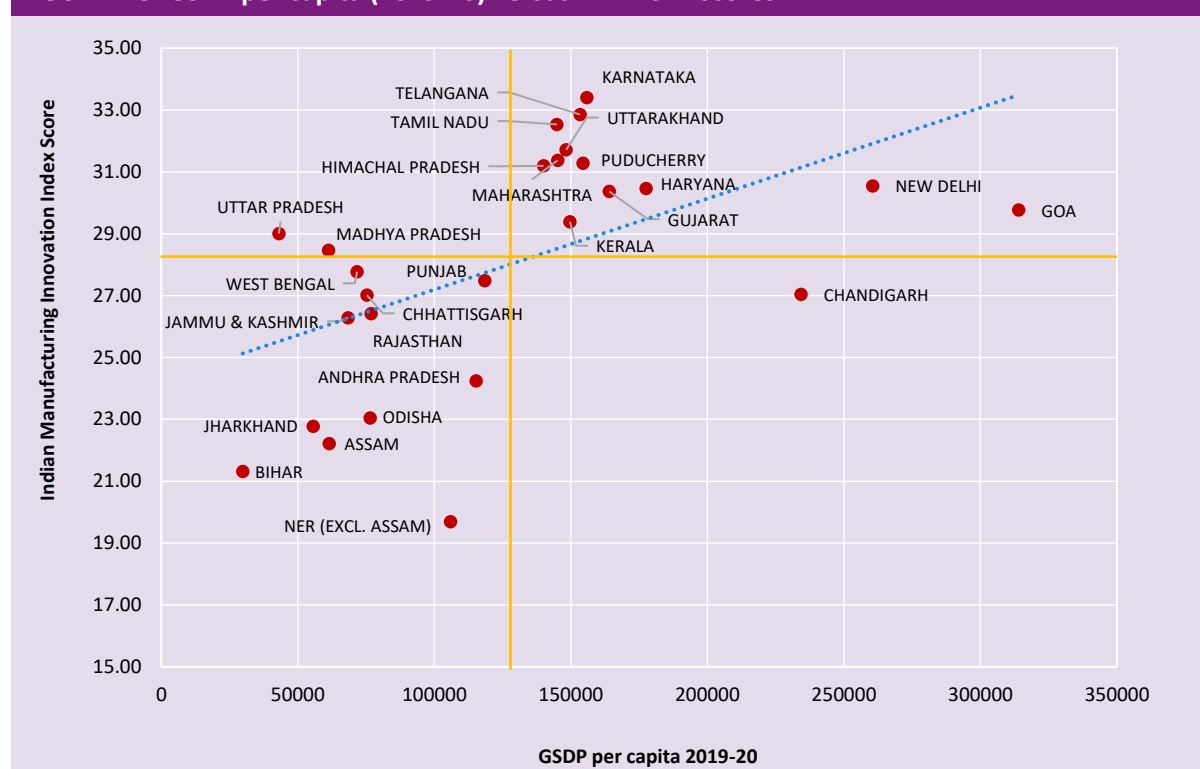
which means that other factors also play a role in determining the Indian manufacturing innovation score. It is important to keep in mind that correlation does not imply causation and that there may be other variables (confounding variables) that are not included in the model that may be influencing both the GSDP per capita and Indian manufacturing innovation score. For example, other factors such as the relative contribution of manufacturing to the state's economy, the availability of skilled labour, government policies, access to capital, or the level of research and development in a state may all be contributing to the Indian manufacturing innovation score and not just GSDP per capita. Additionally, the correlation coefficient of 0.526 is moderate, which means that the relationship between these two variables is not very strong. It could be that there are other factors influencing the IMII scores more than the GDP.

For instance, states with GSDP per capita below INR 160,000, like Karnataka (33.41), Telangana

(32.86), and Tamil Nadu (32.54) have manufacturing innovation scores greater than states or UTs with GSDP per capita above INR 160,000 such as Gujarat (30.37), Haryana (30.47), Chandigarh (27.03), New Delhi (30.55) and Goa (29.77). Efficient planning and

allocation of resources for manufacturing activities in states like Karnataka and Telangana have strengthened their prospects for innovation in addition to the impact of GSDP per capita.

FIGURE 4.5: GSDP per capita (2019-20) versus IMII 2022 scores



4.3. STATE-WISE INDIAN MANUFACTURING INNOVATION INDEX SCORES

Table 4.1 shows the IMII scores and all India ranking of states and union territories of India. The states and UTs are arranged as per the categories of major states, hill states and UT and city states. The states/UTs marked in green represent best performers, that is, states/UTs with IMII scores greater than the national average plus standard deviation of IMII scores.

The states marked in yellow represent average performers, that is, states/UTs with IMII scores between national average plus standard deviation of IMII scores and national average minus standard deviation of IMII scores. The states/UTs marked in amber represent low performers, that is, states/UTs with IMII scores less than the national average minus standard deviation of IMII scores.

The range of the IMII scores is 13.72 with the highest IMII score is for the major state Karnataka (33.41) and the lowest score for

North-eastern states (excluding Assam) (19.69). The range represents significant differences in indicator level performance across 80 indicators. Among the best performers, Karnataka is followed by Dadra & Nagar Haveli and Daman & Diu (32.88), Telangana (32.86), and Tamil Nadu (32.54).

Karnataka has topped the IMII ranking due to its high dimension scores on Performance (32.87) and Enablers (27.28). In the Performance dimension, the state's highest score is in the Innovation Incidence and Characteristics pillar, with a score of 32.94. This is further supported by the fact that 25% of firms in the state reported product innovations, and 10% innovations in procurement, logistics, and distribution in manufacturing, as further discussed in Chapter 5. Additionally, the state is the second-best performer for Innovation Objectives and Outcomes, with a score of 32.80, and the highest share of firms reporting response to existing or forthcoming regulatory provisions (25%) as an outcome achieved.

Under the Enablers dimension, Karnataka has the highest score in Innovation Capabilities (30.28) as the second-best performer, with the highest share of firms employing/engaging experts in advanced digital tools in-house (36%) as discussed in Chapter 6. Additionally, the state is the third-best performer in Innovation Linkages and Knowledge Flows (30.18), with the highest share of firms with informal cooperation agreements (8%) and collaboration with other parties on innovation activities within India (21%). The state is also the third-best performer in the pillar of Innovation Activity and Investment (21.39), with the highest share of firms engaging (44%) and investing (32%) in

knowledge-based capital (KBC) innovation input activities. In conclusion, Karnataka has a strong performance across the various pillars of the IMII ranking, making it the top performer among Indian states.

According to data from the IMII ranking, Dadra & Nagar Haveli & Daman & Diu has the third highest Performance score (30.03) and the highest Enablers score (28.69). In the Performance dimension, the UT is the third-best performer for innovation objectives and outcomes (29.99). In the Enablers dimension, it is the second-best performer for innovation activity and investment (21.79), innovation capabilities (30.78) and innovation linkages and knowledge flows (33.48). Dadra & Nagar Haveli & Daman & Diu has the second-highest share of firms engaging (33.33%) and investing (27.86%) in tangible innovation input activities and the third-highest share of firms investing in knowledge-based capital activities (28.57%). The UT, also, has the highest share in terms of firms highly satisfied with the innovation capabilities of employees (66%) and making use of internal information sources for innovation (58%). Under Linkages, Dadra & Nagar Haveli & Daman & Diu has the highest share of firms reporting formal cooperation agreements. The UT is also the second-best performer for the absence of policy-related barriers (48.60) to innovation input activities. Based on the IMII ranking, Dadra & Nagar Haveli & Daman & Diu has exceptional performance across multiple dimensions of the ranking, which places it as the second-best performer among all states and UTs.

Telangana has the second highest Performance score (32.83) and the third highest Enablers score (28.17). Under Performance, it is one of

the best performers with respect to innovation objectives and outcomes (36.09) and under Enablers, it performs well in innovation capabilities (29.82) and innovation activity and investment (26.12).

Tamil Nadu is the fourth-best performer in IMII scores, with the highest score in Barriers (absence) (44.16). The state is the best performer in the absence of Potential and capability related barriers

(48.04) and Policy related barriers (47.65). Under Performance, it is the fourth-best performer in terms of Innovation Objectives and Outcomes (28.51).

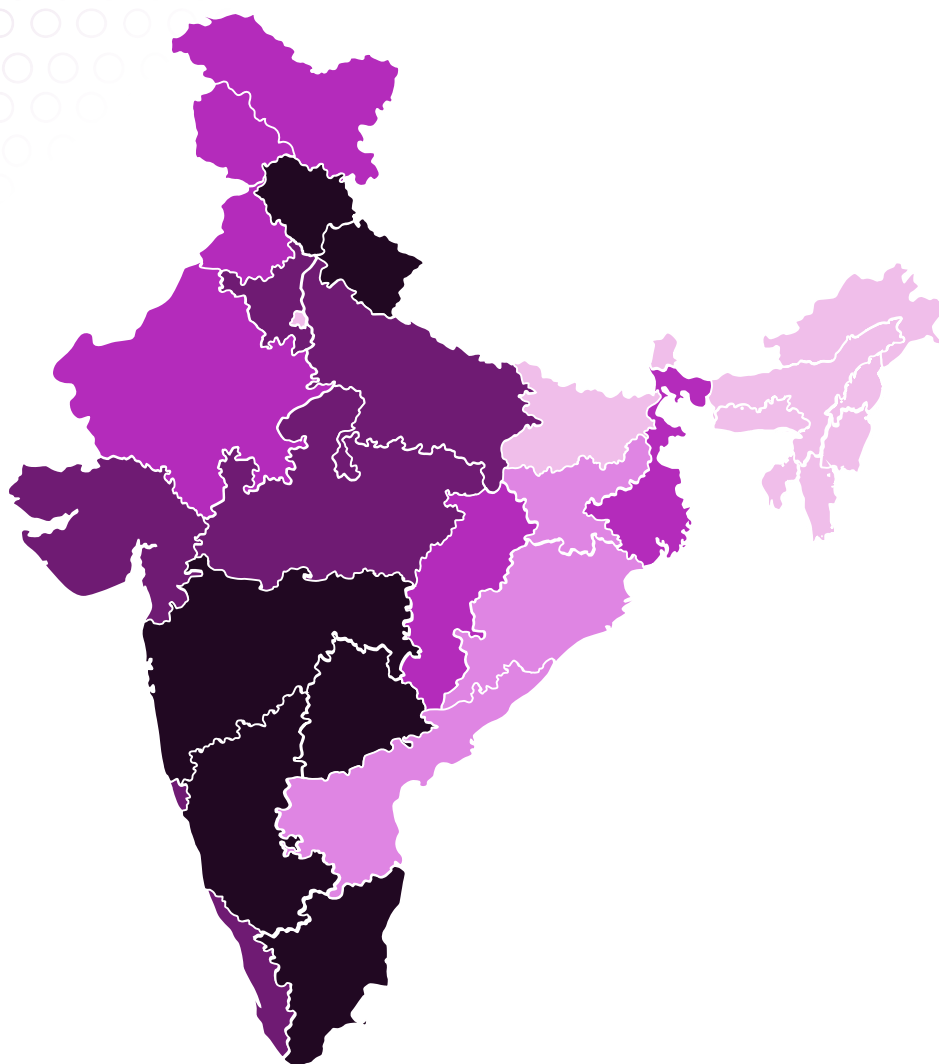
Among the low performers, North-eastern states (excluding Assam) (19.69) are followed by Bihar (21.32), Assam (22.22), Jharkhand (22.78), Odisha (23.05) and Andhra Pradesh (24.25). All other states and UTs are average performers.

TABLE 4.1: State-wise Indian Manufacturing Innovation Scores and Ranking

IMII MAJOR STATE RANK	MAJOR STATES	IMII SCORE	IMII OVERALL RANK	IMII HILL STATE RANK	HILL STATES	IMII SCORE	IMII OVERALL RANK
1	KARNATAKA	33.41	1	1	UTTARAKHAND	31.72	5
2	TELANGANA	32.86	3	2	HIMACHAL PRADESH	31.20	8
3	TAMIL NADU	32.54	4	3	ASSAM	22.22	25
4	MAHARASHTRA	31.38	6	4	NORTH-EASTERN STATES (EXC. ASSAM)	19.69	27
5	HARYANA	30.47	10				
6	GUJARAT	30.37	11				
7	KERALA	29.39	13	HILL STATES AVERAGE		26.21	
8	UTTAR PRADESH	29.00	14	IMII UT & CITY STATES RANK	UT & CITY STATES	IMII SCORE	IMII OVERALL RANK
9	MADHYA PRADESH	28.47	15				
10	WEST BENGAL	27.77	16				
11	PUNJAB	27.48	17	1	DADRA & NAGAR HAVELI & DAMAN & DIU	32.88	2
12	CHHATTISGARH	27.02	19	2			
13	RAJASTHAN	26.42	20	3	PUDUCHERRY	31.29	7
14	ANDHRA PRADESH	24.25	22	4	NEW DELHI	30.55	9
15	ODISHA	23.05	23	5	GOA	29.77	12
16	JHARKHAND	22.78	24	6	CHANDIGARH	27.03	18
17	BIHAR	21.32	26	7	JAMMU & KASHMIR	26.29	21
MAJOR STATES AVERAGE		28.12		UT & CITY STATES AVERAGE		29.64	
NATIONAL AVERAGE		28.17					
STANDARD DEVIATION	3.86		NATIONAL AVERAGE + STANDARD DEVIATION	32.03		NATIONAL AVERAGE - STANDARD DEVIATION	24.31

Best Performers Above national average + standard deviation	Average Performers Between national average + standard deviation and national average - standard deviation	Low Performers Below national average - standard deviation
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FIGURE 4.6: State-wise Indian Manufacturing Innovation Index (IMII) 2022 scores



Score Range	19.69 - 22.43	22.43 - 25.18	25.17 - 27.92	27.92 - 30.67	30.66 - 33.41
Legend					

Based on data from Table 4.2, the top performers in the Enablers (presence) dimension are Dadra & Nagar Haveli and Daman & Diu (28.69), Telangana (28.17), Karnataka (27.28), Maharashtra (26.06), Gujarat (25.50), and Goa (25.33). On the other hand, the lowest performers in this dimension are Bihar (12.47), Odisha (12.88), North-eastern states (excluding Assam) (13.00), and Jharkhand (14.53). The remaining states and UTs are average performers in Enablers.

When it comes to the Barriers (absence) dimension, the best performers are Puducherry (50.83) and Tamil Nadu (44.16), while the least performers are North-eastern states (excluding Assam) (25.42), Assam (27.82), Jharkhand (30.93), and Chandigarh (32.16). All other states and UTs are average performers in Barriers (absence).

In the Performance dimension, the top performers are Karnataka (32.87), Telangana (32.83), Maharashtra (30.27), and Dadra & Nagar

Haveli and Daman & Diu (30.03). On the other hand, the lowest performers are Bihar (17.10), Andhra Pradesh (20.48), North-eastern states

(excluding Assam) (20.65), and Odisha (21.63). The remaining states and UTs are average performers in Performance.

TABLE 4.2: IMII dimension scores by state categories

	MAJOR STATES			
	IMII SCORE	ENABLERS (PRESENCE) SCORE	BARRIERS (ABSENCE) SCORE	PERFORMANCE SCORE
KARNATAKA	33.41	27.28	40.07	32.87
TELANGANA	32.86	28.17	37.57	32.83
TAMIL NADU	32.54	24.37	44.16	29.07
MAHARASHTRA	31.38	26.07	37.79	30.27
HARYANA	30.47	22.92	40.84	27.63
GUJARAT	30.37	25.50	38.18	27.43
KERALA	29.39	21.43	41.74	25.01
UTTAR PRADESH	29.00	18.37	43.28	25.36
MADHYA PRADESH	28.47	20.03	40.55	24.82
WEST BENGAL	27.77	17.06	39.03	27.23
PUNJAB	27.48	16.95	40.69	24.81
CHHATTISGARH	27.02	18.39	39.55	23.12
RAJASTHAN	26.42	19.78	35.57	23.92
ANDHRA PRADESH	24.25	16.92	35.35	20.48
ODISHA	23.05	12.88	34.63	21.63
JHARKHAND	22.78	14.53	30.93	22.86
BIHAR	21.32	12.47	34.40	17.10
MAJOR STATES AVERAGE	28.12	20.18	38.49	25.67
HILL STATES				
UTTARAKHAND	31.72	22.93	43.23	28.99
HIMACHAL PRADESH	31.20	22.77	43.27	27.55
ASSAM	22.22	16.64	27.82	22.18
NORTH-EASTERN STATES (EXC. ASSAM)	19.69	13.00	25.42	20.65
HILL STATES AVERAGE	26.21	18.84	34.94	24.84

UT & CITY STATES				
DADRA & NAGAR HAVELI & DAMAN & DIU	32.88	28.69	39.92	30.03
PUDUCHERRY	31.29	19.68	50.83	23.35
NEW DELHI	30.55	24.08	40.27	27.31
GOA	29.77	25.33	38.05	25.94
CHANDIGARH	27.03	22.09	32.16	26.84
JAMMU & KASHMIR	26.29	15.76	38.96	24.16
UT & CITY STATES AVERAGE	29.64	22.61	40.03	26.27
NATIONAL AVERAGE	28.17	20.52	38.31	25.68
STD. DEV	3.86	4.80	5.26	3.74
NATIONAL AVERAGE + STANDARD DEVIATION	32.03	25.32	43.57	29.43
NATIONAL AVERAGE - STANDARD DEVIATION	24.31	15.72	33.04	21.94

Best Performers Above national average + standard deviation	Average Performers Between national average + standard deviation and national average - standard deviation	Low Performers Below national average - standard deviation
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The IMII consists of nine pillars (Table 4.3), namely Innovation Activities and Investment, Innovation Capabilities, Innovation Linkages and Knowledge Flows, Absence of Potential and capability-related Barriers, Absence of Financing-related Barriers, Absence of Policy-related Barriers, Absence of Market and Linkages-related Barriers, Innovation Incidence and Characteristics and Innovation Objectives and Outcomes.



Innovation Activities and Investment

The top performers in this pillar are Telangana (26.12), Dadra & Nagar Haveli & Daman & Diu (21.79), Karnataka (21.39) and Goa (19.16). The lowest performers are Odisha (6.30), Bihar (6.91) and Jharkhand (8.81).



Innovation Capabilities

The best performers in this pillar are Dadra & Nagar Haveli & Daman & Diu (30.78), Karnataka (30.28), Telangana (29.82), Maharashtra (29.59), Gujarat (28.63) and New Delhi (28.15). The lowest performers are Bihar (13.38), Odisha (14.00), North-eastern states (excluding Assam) (14.45) and Jharkhand (15.25).



Innovation Linkages and Knowledge Flows

The top performers in this pillar are Dadra & Nagar Haveli & Daman & Diu (33.48), Gujarat (31.78), Karnataka (30.18), New Delhi (30.11) and Maharashtra (29.85). The lowest performers are North-eastern states (excluding Assam) (13.97), Bihar (17.12), Jammu & Kashmir (17.94), Odisha (18.33) and Assam (18.65).



Absence of Potential and Capability-related Barriers

Puducherry (55.17), Uttarakhand (48.63), Tamil Nadu (48.04) and Uttar Pradesh (47.38) are the best performers in this pillar. The lowest performers are North-eastern states (excluding Assam) (28.29), Assam (30.76), Jharkhand (34.13) and Chandigarh (35.18).



Absence of Financing-related Barriers

Puducherry (47.09) and Uttar Pradesh (36.20) are the best performers in this pillar. The lowest performers are North-eastern states (excluding Assam) (20.05), Assam (22.41) and Chandigarh (23.82).



Absence of Policy-related Barriers

Himachal Pradesh (49.08), Dadra & Nagar Haveli & Daman & Diu (48.60), Puducherry (47.83) and Tamil Nadu (47.65) are the best performers in this pillar. The lowest performers are North-eastern states (excluding Assam) (26.68), Assam (29.16), Jharkhand (32.76) and Andhra Pradesh (35.26).



Absence of Market and Linkages-related Barriers

Puducherry (53.23), Uttarakhand (47.60), Uttar Pradesh (45.98) are the best performers in this pillar. The lowest performers are North-eastern states (excluding Assam) (26.65), Assam (28.96), Jharkhand (30.55) and Chandigarh (33.64).



Innovation Incidence and Characteristics

The top performers in this pillar are Karnataka (32.94), Maharashtra (32.35), Himachal Pradesh (31.60) and West Bengal (31.46). The lowest performers are Bihar (20.49), Andhra Pradesh (21.99) and Chhattisgarh (23.81) with scores in bracket. Other states and UTs are average performers in this pillar.



Innovation Objectives and Outcomes

Telangana (36.09), Karnataka (32.80), Dadra & Nagar Haveli & Daman & Diu (29.99) and Tamil Nadu (28.51) are the best performers. The lowest performers are Bihar (13.70), North-eastern states (excluding Assam) (16.11) and Odisha (16.65).

The rest of the states and UTs are average performers across these pillars.

TABLE 4.3: IMII pillar scores by state categories




MAJOR STATE	ENABLERS (PRESENCE)			BARRIERS (ABSENCE)				PERFORMANCE	
	INNOVATION ACTIVITIES & INVESTMENT PILLAR SCORE	INNOVATION CAPABILITIES PILLAR SCORE	INNOVATION LINKAGES & KNOWLEDGE FLOWS & PILLAR SCORE	POTENTIAL & CAPABILITIES BARRIERS (ABSENCE) PILLAR SCORE	FINANCE BARRIERS (ABSENCE) PILLAR SCORE	POLICY BARRIERS (ABSENCE) PILLAR SCORE	MARKET & LINKAGE BARRIERS (ABSENCE) PILLAR SCORE	INNOVATION INCIDENCE & CHARACTERISTICS PILLAR SCORE	INNOVATION OBJECTIVES & OUTCOMES PILLAR SCORE
KARNATAKA	21.39	30.28	30.18	44.13	29.98	43.84	42.34	32.94	32.80
TELANGANA	26.12	29.82	28.56	40.87	30.97	40.08	38.37	29.58	36.09
TAMIL NADU	17.49	26.37	29.26	48.04	35.73	47.65	45.24	29.64	28.51
MAHARASHTRA	18.76	29.59	29.85	41.08	27.43	43.56	39.09	32.35	28.19
HARYANA	16.73	25.50	26.54	44.93	31.84	44.31	42.30	29.62	25.65
GUJARAT	16.09	28.63	31.78	41.68	26.68	46.20	38.17	29.31	25.56
KERALA	12.85	23.45	28.00	46.18	32.72	45.95	42.11	27.98	22.04
UTTAR PRADESH	13.27	20.13	21.70	47.38	36.20	43.55	45.98	27.86	22.87
MADHYA PRADESH	13.51	21.51	25.07	45.22	31.10	43.04	42.83	25.58	24.06
WEST BENGAL	11.17	18.33	21.68	41.95	34.32	39.17	40.67	31.46	23.00
PUNJAB	13.81	17.25	19.81	43.72	34.84	40.62	43.56	26.59	23.03
CHHATTISGARH	11.07	19.94	24.15	43.46	32.44	42.93	39.34	23.81	22.42
RAJASTHAN	13.47	20.79	25.07	40.06	26.78	37.76	37.69	25.58	22.26
ANDHRA PRADESH	12.59	17.34	20.83	38.45	31.05	35.26	36.65	21.99	18.96
ODISHA	6.30	14.00	18.33	38.00	26.01	38.39	36.12	26.62	16.65
JHARKHAND	8.81	15.25	19.55	34.13	26.30	32.76	30.55	25.88	19.83
BIHAR	6.91	13.38	17.12	39.54	26.40	35.57	36.08	20.49	13.70
MAJOR STATES AVERAGE	14.14	21.86	24.56	42.28	30.63	41.21	39.83	27.49	23.86
HILL STATES									
UTTARAKHAND	17.23	24.93	26.63	48.63	33.04	43.66	47.60	30.46	27.52
HIMACHAL PRADESH	15.08	25.58	27.64	44.53	35.64	49.08	43.83	31.60	23.51
ASSAM	14.15	17.12	18.65	30.76	22.41	29.16	28.96	25.40	18.97
NORTH-EASTERN STATES (EXCLUDING ASSAM)	10.59	14.45	13.97	28.29	20.05	26.68	26.65	25.20	16.11
HILL STATES AVERAGE	14.26	20.52	21.72	38.05	27.79	37.15	36.76	28.17	21.53
UT & CITY STATES									
DADRA & NAGAR HAVELI & DAMAN & DIU	21.79	30.78	33.48	41.82	30.11	48.60	39.16	30.07	29.99
PUDUCHERRY	12.47	21.60	24.97	55.17	47.09	47.83	53.23	25.76	20.94
NEW DELHI	13.97	28.15	30.11	43.12	32.96	44.18	40.81	30.73	23.90
GOA	19.16	27.84	28.99	40.65	29.02	43.63	38.88	27.31	24.58
CHANDIGARH	14.82	27.30	24.14	35.18	23.82	36.02	33.64	30.64	23.04
JAMMU & KASHMIR	11.33	18.00	17.94	42.23	31.56	40.31	41.72	27.71	20.61
UT & CITY STATES AVERAGE	15.59	25.61	26.61	43.03	32.43	43.43	41.24	28.7	23.84
NATIONAL AVERAGE	14.48	22.49	24.59	27.86	23.51	41.82	30.61	41.1	39.69
STD. DEV	4.47	5.56	5.09	3.12	4.94	5.55	5.31	5.72	5.66
NATIONAL AVERAGE + STANDARD DEVIATION	18.95	28.06	29.68	30.97	28.45	47.37	35.92	46.83	45.35
NATIONAL AVERAGE - STANDARD DEVIATION	10.01	16.93	19.50	24.74	18.57	36.27	25.30	35.38	34.02

Best Performers
Above national average + standard deviation

Average Performers
Between national average + standard deviation and national average - standard deviation

Low Performers
Below national average - standard deviation

TABLE 4.4: Share of firms across the 80 indicators at the national-level (%)

Indicators	Share of firms (%)
Pillar 1: Innovation Activities and Investment	
Firms that engaged in tangible activities for innovation	8.71%
Firms that engaged in knowledge-based capital (KBC) or intangible activities for innovation	13.54%
Firms that invested in tangible activities for innovation	14.90%
Firms that invested in KBC or intangible activities for innovation	21.28%
Pillar 2: Innovation Capabilities	
Firms with internal sources of financing available for innovation activities	22.76%
Firms that used innovative tools and practices among staff that are successful	13.62%
Firms highly satisfied with innovation capabilities of employees	51.03%
Firms that made use of internal information sources for innovation	37.78%
Firms that used advanced, enabling or emerging technologies	6.48%
Firms with an R&D strategy	14.55%
Firms that employed highly qualified personnel, by level of educational attainment	29.61%
Firms with R&D staff	12.36%
Firms that employed experts in Industry 4.0 and advanced digital tools in house	23.15%
Firms with an I4.0 strategy	3.86%
Firms with internal funding available for training	23.35%
Pillar 3: Innovation Linkages & Knowledge Flows	
Firms highly satisfied with investment climate in the state	52.89%
Firms highly satisfied with ease of doing business in the state	55.52%
Firms highly satisfied with govt. support for enabling innovation	41.53%
Firms highly satisfied with innovation infrastructure in the state	46.57%
Firms highly satisfied with innovation capabilities of external talent pool	33.24%
Firms with formal cooperation agreements for innovation	3.78%
Firms that engaged experts in Industry 4.0 and advanced digital tools from external sources	7.51%
Firms that exported to international markets	21.96%
Firms that imported from international markets	9.03%
Firms with informal cooperation for innovation	5.14%
Firms that collaborated with Indian entities on innovation activities	14.02%
Firms that collaborated with foreign entities on innovation activities	3.74%
Firms making use of external information sources for innovation	33.25%
Firms with external sources of financing for innovation activities	6.60%

Firms with external funding available for training	2.50%
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Pillar 4: Potential & Capabilities Barriers (absence)



Firms that reported no impact of insufficient innovation capability (R&D, design, etc.) On innovation activities	37.83%
Firms that reported no impact of organizational rigidities (inflexibility) within the firm on innovation activities	43.86%
Firms that reported no impact of lack of need due to prior innovations by the firm on innovation activities	45.81%
Firms that reported no impact of lack of qualified personnel on innovation activities	38.11%
Firms that reported no impact of lack of good ideas for innovations on innovation activities	44.86%
Firms that reported no impact of lack of firm-level infrastructure on innovation activities	42.41%

Pillar 5: Financing Barriers (absence)



Firms that reported no impact of lack of funds within the firm or group on innovation activities	26.52%
Firms that reported no impact of lack of finance from sources outside the firm (credit) on innovation activities	30.86%
Firms that reported no impact of excessive perceived risks on innovation activities	34.59%
Firms that reported no impact of innovation costs too high on innovation activities	30.78%

Pillar 6: Policy Barriers (absence)



Firms that reported no impact of regulations, standards, and taxation in hampering innovation activities	41.16%
Firms that reported no impact of weakness in protection, acquisition and/or utilization of intellectual property rights on innovation activities	47.94%
Firms that reported no impact of legislative barriers on innovation activities	35.76%

Pillar 7: Market & Linkage Barriers (absence)



Firms that reported no impact of lack of information on markets on innovation activities	40.19%
Firms that reported no impact of deficiencies in the availability of external services on innovation activities	39.21%
Firms that reported no impact of difficulty in finding cooperation partners on innovation activities	41.78%
Firms that reported no impact of lack of information on technology on innovation activities	39.53%
Firms that reported no impact of market dominance by established firms on innovation activities	39.06%
Firms that reported no impact on innovation activities because of lack of incentive to innovate due to very little competition in firm's market	48.18%
Firms that reported no impact of uncertain demand for innovative goods or services on innovation activities	36.72%
Firms that reported no impact of low demand for innovations in the market on innovation activities	35.24%

Pillar 8: Innovation Incidence & Characteristics



Firms with new or significantly improved goods	13.50%
Firms with new or significantly improved services	3.73%
Firms into innovations in operations and product/process development	12.22%
Firms into innovations in marketing and sales	6.94%
Firms into innovations in procurement, logistics, and distribution	5.15%
Firms into innovations in administration and management	4.59%
Product innovators that reported new-to-market (NTM) innovations	6.42%
Business process innovators that reported NTM innovations	2.43%
Firms that reported in-house product innovations	95.87%
Firms that reported in-house business process innovations (BPI)	80.06%

Pillar 9: Innovation Objectives & Outcomes



Innovation Objectives

Firms that reported innovation objective of increasing their turnover	28.70%
Firms that reported innovation objective of increasing their market presence	30.75%
Firms that reported innovation objective of enhancing product/process in terms of quality and quantity	25.27%
Firms that reported innovation objective of reducing environmental impacts	20.32%
Firms that reported innovation objective of reducing costs	24.71%
Firms that reported innovation objective of improving health and safety of their employees	19.41%
Firms that reported innovation objective of meeting regulatory requirements (e.g. Standards, etc.)	19.40%
Firms that reported innovation objective of catering to Corporate Social Responsibility	17.35%

Innovation Outcomes

Firms that reported improvement in their firm's turnover as a result of innovations	20.84%
Firms that reported opening up of new market opportunities as a result of innovations	20.18%
Firms that were able to respond to market pressures as a result of innovations	19.33%
Firms that were able to respond to cost pressures as a result of innovations	18.06%
Firms that were able to respond to existing or forthcoming regulatory provisions as a result of innovations	13.57%
Firms that attained any of the above innovation outcomes through I4.0 technologies	4.68%
Firms that were granted IP rights	16.79%
Firms that reported turnover from new-to-market product innovations	42.72%
Firms that reported turnover from NTM business process innovations	22.29%
Employment in innovative firms (as a percentage of total employment)	45.18%

A large yellow industrial robotic arm is positioned in a warehouse or factory setting. The arm is reaching over a conveyor belt system. In the background, there are stacks of cardboard boxes on pallets. The entire image has a semi-transparent purple and blue overlay with a pattern of white circles. A large white number '5' is positioned on the left side of the image.

5

INNOVATION ENABLERS

INNOVATION ENABLERS

Enablers are essential components in facilitating innovation within a manufacturing firm. They are comprised of three interrelated elements, namely the firm's investment in innovation input activities and related investments, the internal capabilities of the organisation, and the enabling environment in which it operates. Measured through the linkages and knowledge flows in the system, these elements work together to drive innovation within a firm.

Investment in innovation activities and related investments is a crucial component of the enabler equation as it allows the firm to produce knowledge-based assets that can be leveraged in the innovation process. These assets are instrumental in the development of new products and processes, which are key outcomes of the innovation cycle.

In addition to investment in innovation, a firm's internal capabilities and its access to a supportive environment also play critical roles in the success of innovation efforts. A firm with well-developed internal capabilities and a favourable environment is better equipped to develop and implement new products and processes, consequently resulting in improved efficiency, productivity, and competitiveness.

In conclusion, the three pillars of innovation enablers, i.e., *innovation activity and investment, innovation capabilities, and innovation linkages and knowledge flows*, are interdependent and of equal importance in driving innovation within a manufacturing firm.

5.1. INNOVATION ACTIVITIES AND INVESTMENT

Innovation activities and investment are critical components of facilitating innovation within a firm. Innovation activities enable a firm to create knowledge-based assets, such as new technologies and processes, which can be leveraged to drive innovation efforts. Investment in these activities enables the organisation to develop and implement new ideas, processes, and products that can enhance its competitiveness, efficiency, and productivity.

In addition, investment in innovation activities also helps the firm stay ahead of the curve and abreast of industry trends and advancements. This can provide a competitive advantage and help the firm maintain its position as a leader in its field. Moreover, investment in innovation can also lead to the creation of new markets and business opportunities, which can drive growth and increase the firm's bottom line.

5.1.1. Engagement in Innovation Activities

A firm is considered to be '**innovation-active**' if it engages in one or more activities during the observation period in pursuit of innovation, that is, aimed at developing or implementing new or improved products or business processes.

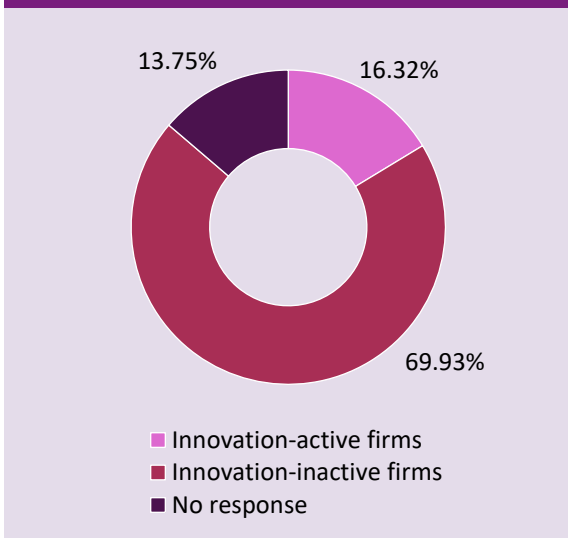
During the observation period, any given innovation activity of the firm can (OECD, 2018):

- Result in an innovation: The innovation activity can consequently cease during the observation period after implementation, or it could still be ongoing if it is undertaken for other innovation projects.
- Be ongoing without an innovation: Work can still be in progress and proceeding according to plan, or delayed due to various reasons, such as technical difficulties or a shortage of expertise or finance.
- Be aborted, discontinued, or put on hold, for instance, when activities to develop an innovation are stopped before implementation.

Hence, both innovative and non-innovative firms can undertake such activities, that is, be innovation-active. A non-innovative firm is considered innovation-active only if it had one or more ongoing, suspended, abandoned or completed activities that did not result in innovation during the observation period.

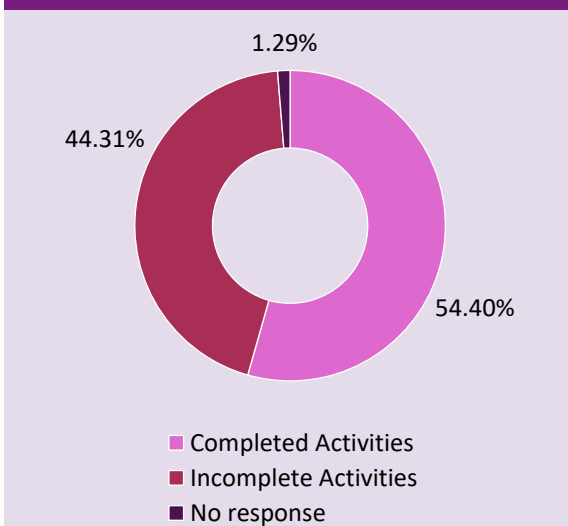
The results of NMIS survey shows that $1/6^{th}$ of the firms surveyed (16.32%) were innovation-active, that is, they engaged in any innovation (input) activity³⁷ at some point during the observation period in pursuit of innovation, i.e., with an intention to develop either a product or a business process innovation (Figure 5.1). On the other hand, 69.93% of the firms were innovation-inactive, meaning either they did not engage in an innovation activity during the observation period, or they conducted activities *regardless of its purpose* (without an intent to innovate); 13.75% of firms did not respond to the question on engagement in innovation activities.

FIGURE 5.1: Share of innovation-active and innovation-inactive firms



As shown in Figure 5.1 & 5.2, out of the 16.32% of firms that were innovation active, 54.40% were able to complete their innovation input activities during the observation period, i.e., they did not report incomplete, abandoned, or seriously delayed activities. However, 44.31% of innovation-active firms could not complete their innovation activities during the observation period.

FIGURE 5.2: Complete versus incomplete activities



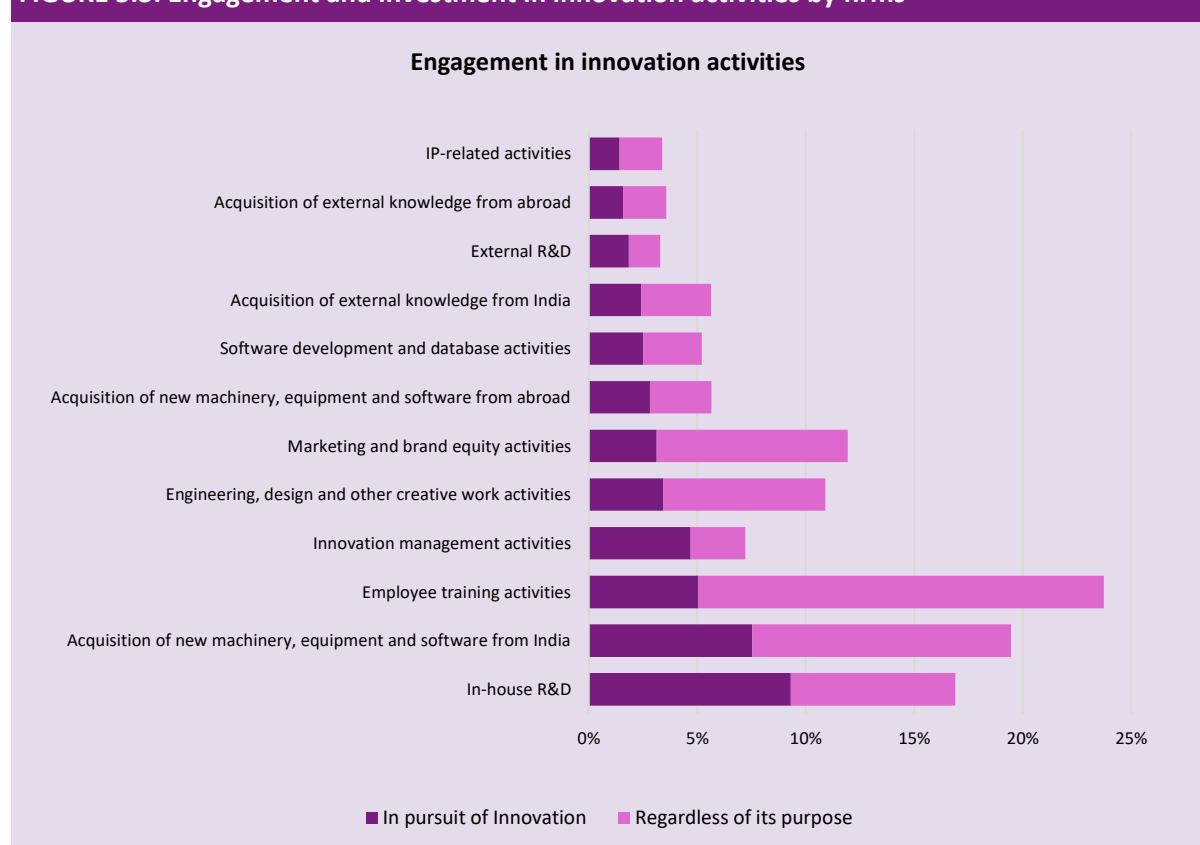
³⁷ Innovation activities are discussed in the upcoming sections

Firms can undertake eight different types of activities in the “pursuit of innovation”. These activities, many of which are knowledge-based, can also be performed for more general purposes, i.e., without a specific intention to innovate. The activities include the acquisition or lease of tangible assets, research and experimental development (R&D), engineering, design and other creative work, marketing and brand equity, IP-related activities, employee

training, software development and database activities, and innovation management activities.

Figure 5.3 shows the engagement of firms in innovation activities, both in pursuit of innovation and regardless of its purpose, as well as the investment levels in these activities. Firms conducted these activities in either an informal or systematic manner to explore opportunities, assess challenges, and bring about changes.

FIGURE 5.3: Engagement and investment in innovation activities by firms



The results of the NMIS survey show that less than 10% of firms reported engaging in any of the aforementioned activities in pursuit of innovation. However, more firms took up innovation-related activities regardless of their purpose. The most common innovation-oriented activity by innovation-active firms was in-house

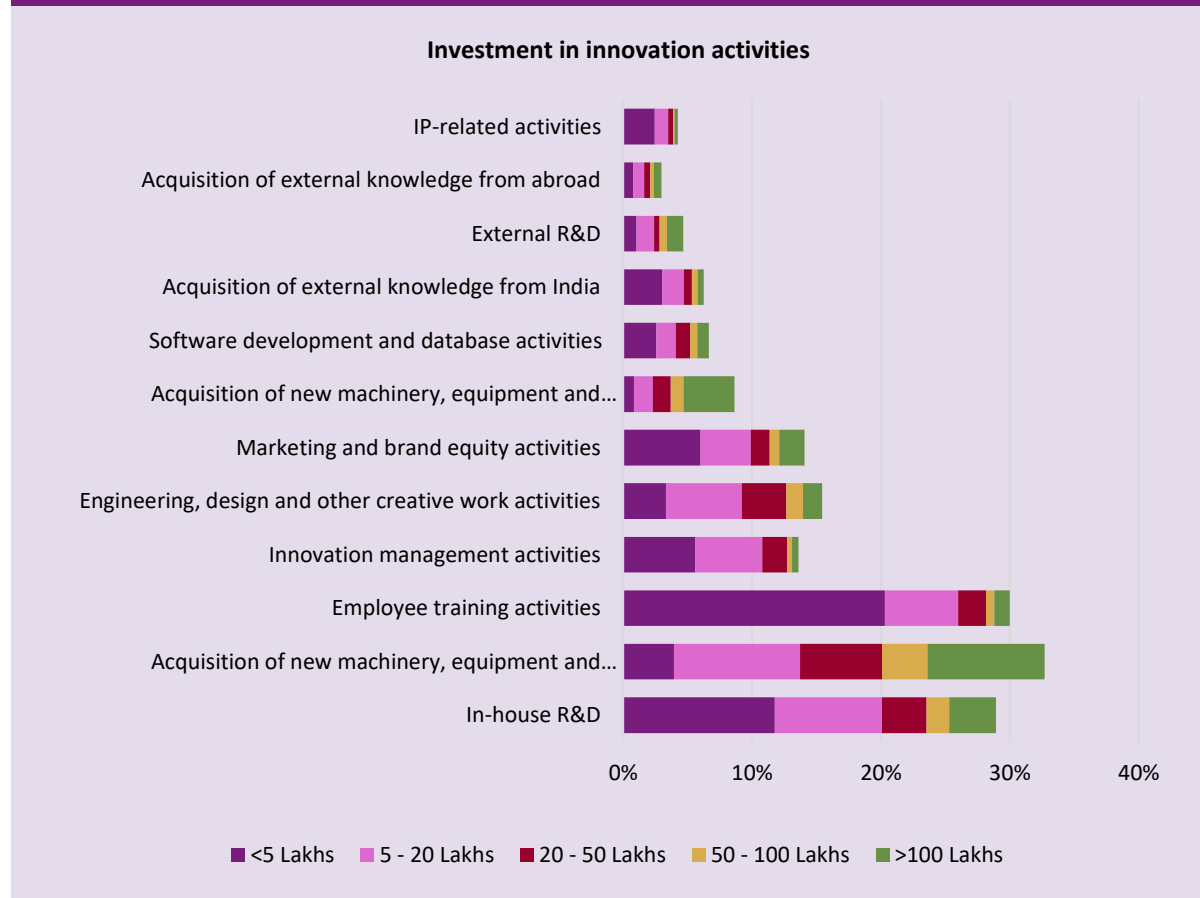
R&D (9.3%), followed by the acquisition of new plant, machinery or equipment from India (7.5%) and employee training activities (5.0%). The least common activity was IP-related activities (1.4%) followed by the acquisition of external knowledge from abroad (1.5%)

However, regardless of their purpose, about one-fifth of the surveyed firms conducted employee training (19.0%), while 12% of firms were engaged in the acquisition of a new plant, machinery or equipment from India, and marketing & brand equity activities (9.0%). The least common activities were IP-related activities (1.0%) followed by the acquisition of external knowledge from abroad (2.0%). More firms took up engineering, design and creative work activities regardless of its purpose than those in pursuit of innovations.

5.1.2. INVESTMENT IN INNOVATION ACTIVITIES

Figure 5.4 shows that the level of investment in innovation activities in firms was low. Importantly, the majority of firms that were surveyed did not disclose their investment in innovation activities due to privacy concerns. Of the firms that responded to the question, depending on specific innovation activities (with a response ratio between 38% - 41%), about 65% to 94% did not invest in innovation activities at all, while less than 10% of firms made significant investments in any of these activities.

FIGURE 5.4: Investment in innovation activities³⁸



³⁸ 59% to 62% of total survey respondents did not answer this question. Figure 12 shows the investment levels of those firms that responded to this question, which is around 38% to 41% firms (between sectors, states and firm sizes)

The least invested activities were the acquisition of external knowledge from abroad (3%) and IP-related activities (4%). The most common investment activity was the acquisition of new plant, machinery, or equipment from India (31.6%), followed by employee training (31.5%) and in-house R&D (29.9%). While one-fifth of firms invested below INR 20 lakh in in-house R&D (21%), only 9% of firms indicated investments greater than INR 20 lakh. Employee training had the highest investment, where more firms (27%) invested less than INR 20 lakh while 4% invested greater than INR 20 lakh.

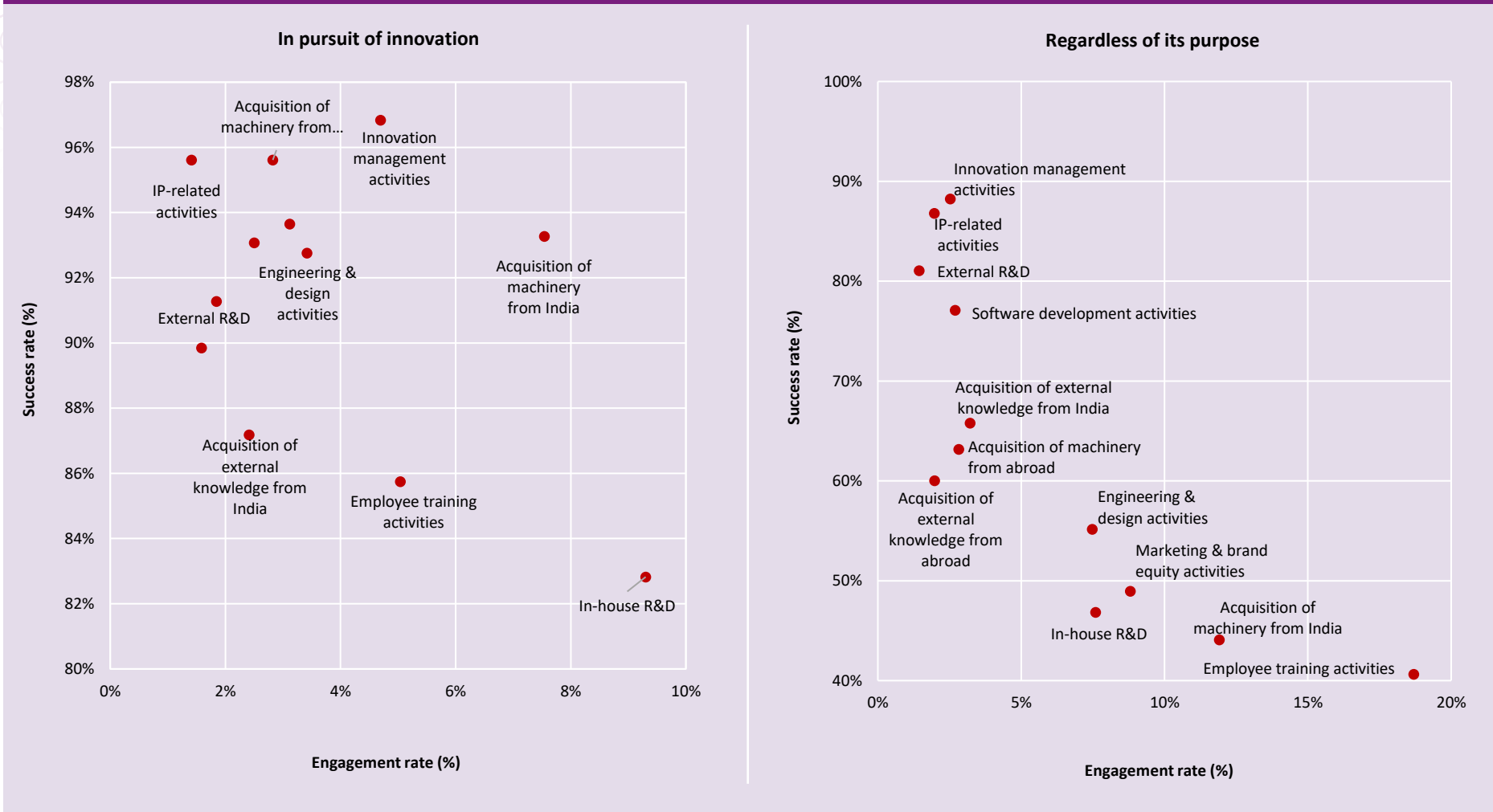
Furthermore, a larger share of firms invested more in the acquisition of new plant, machinery, or equipment compared to R&D investments, with 18% of firms investing INR >20 lakh in the former, while only 9% invested the same amount in in-house R&D. The least invested activities were the acquisition of external knowledge from abroad (3%) and IP-related activities (4%).

The survey results show that a significant majority of firms who engaged in activities specifically aimed at innovation were successful, with success rates ranging from 80-100%. Specifically, of the firms that engaged in in-house R&D (9.3%), 82.2% were successful in introducing an innovation. Innovation management activities and IP-related activities were reported as the most successful innovation activities, with a success rate of 97%.

On the other hand, while a higher proportion of firms engaged in innovation activities regardless of their purpose, success rates for these activities were found to be lower. For instance, of the 19% of firms that conducted employee training activities, only 41% succeeded in introducing innovations. Comparatively, 5% of firms that conducted employee training activities in pursuit of innovation had an 86% success rate. These findings indicate that activities specifically aimed at innovation tend to yield higher success rates when compared to those conducted for general purposes.

Success Rate of Innovation Activities

FIGURE 5.5: Success rates of innovation activities conducted in pursuit of innovation



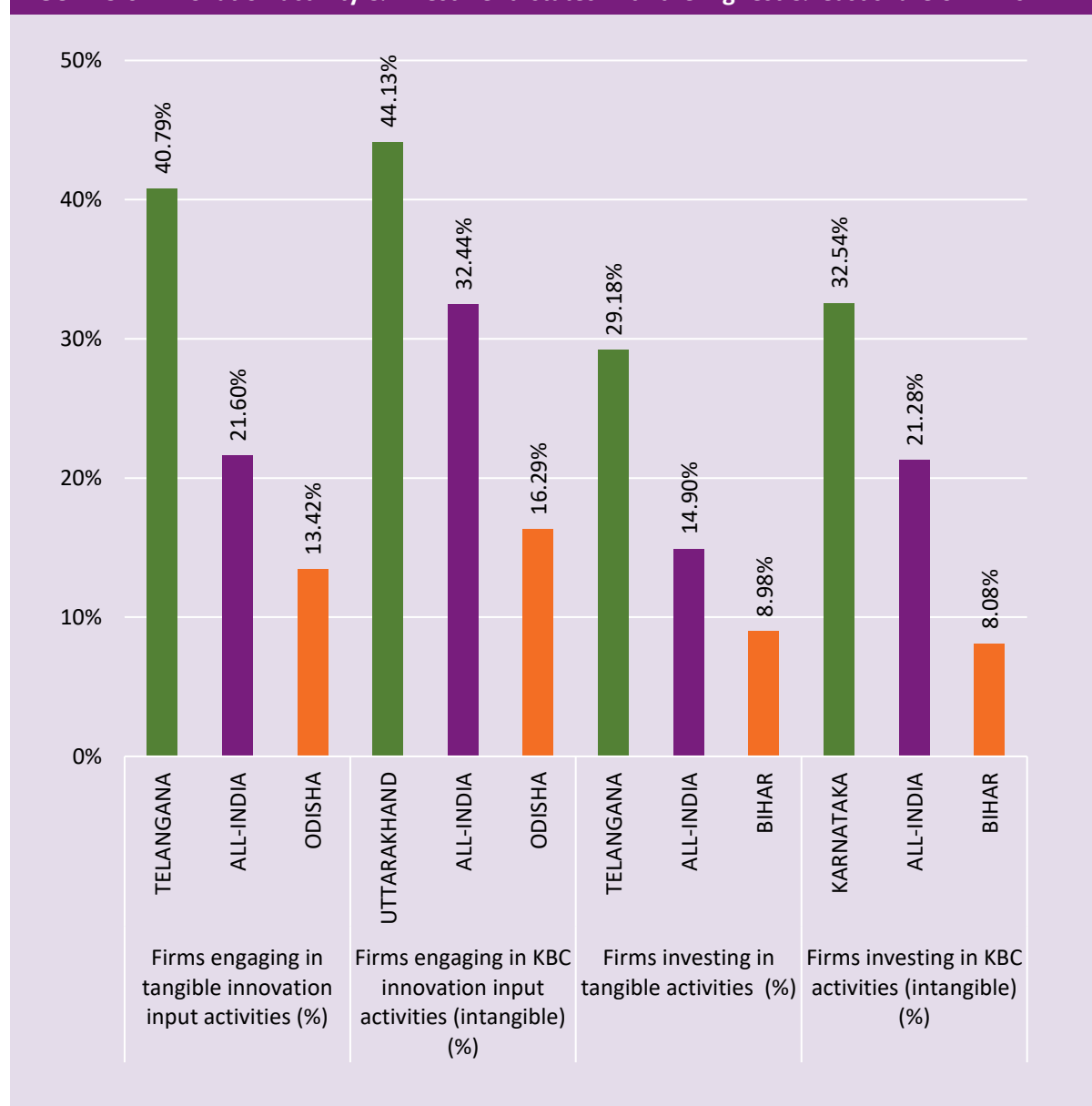
5.1.3. INNOVATION ACTIVITY & INVESTMENT BY FIRMS: STATE-WISE

Innovation activity & investment: states with the highest & least share of firms

The Innovation Activity and Investment Pillar of the study comprised of four indicators, which

reflect the extent of engagement and investment in tangible inputs activities (buying machinery, equipment or any physical assets) for innovation and intangible knowledge-based capital (KBC) innovation input activities. Figure 5.6 showcases the distribution of the top-performing state, the all-India average, and the least-performing state for each of the four indicators.

FIGURE 5.6: Innovation activity & investment: states with the highest & least share of firms



In Table 5.1, states and UTs are categorised into three performance levels: best performers, Average performers, and Low performers. The performance classification is based on the share of firms that reported engagement in tangible innovation input activities and KBC innovation input activities, and investment in tangible assets and intangible assets (KBC).

- **Best performers** for each indicator are those states with the share of firms that reported that indicator greater than the all-India share plus the standard deviation of that indicator.
- **Average performers** had a share of firms that reported a particular indicator between the all-India share plus standard deviation and an all-India share minus standard deviation for that indicator.
- **Low performers** are those states with a share of firms that reported that indicator less than the all-India share minus standard deviation.

As shown in figure 5.6 & table 5.1, the data on innovation activity and investment in Indian states show varying performance levels across the country. In terms of **tangible innovation input activities**, the national average reported is 22%, while the states with the highest share of firms are Telangana (40.79%) and Dadra & Nagar

Haveli and Daman & Diu (33.33%) and states with the lowest share of firms are Odisha (13.42%) and Bihar (13.47%). Similarly, the national average reported for **KBC innovation input activities** is 32%, while states with the highest share of firms are Uttarakhand (44.13%) and Karnataka (43.88%), and the states with the lowest share of firms are Odisha (16.29%) and Bihar (17.37%).

In terms of **investment in tangible assets**, the national average reported is 15%, while states with the highest share of firms are Telangana (29.18%) and Dadra & Nagar Haveli and Daman & Diu (27.86%), and states with the lowest share of firms are Bihar (8.98%) and New Delhi (9.28%). For **investment in KBC intangible assets**, the national average reported is 21%, while states with the highest share of firms are Karnataka (32.54%) and Telangana (29.75%), followed by Dadra & Nagar Haveli and Daman & Diu (28.57%) and Gujarat (28.47%).

In conclusion, the data highlights the disparities in innovation activity and investment across the states in India, with some states performing significantly better than others. These findings can provide valuable insights for policymakers to allocate resources and support for developing innovative capabilities in the country.

TABLE 5.1: Innovation activities & investment: states with the best, average & lowest share of firms

STATES	FIRMS ENGAGING IN TANGIBLE INNOVATION INPUT ACTIVITIES	FIRMS ENGAGING IN KBC INNOVATION INPUT ACTIVITIES	FIRMS INVESTING IN TANGIBLE ACTIVITIES	FIRMS INVESTING IN KBC ACTIVITIES
ALL-INDIA	21.60%	32.44%	14.90%	21.28%
MAJOR STATES				
ANDHRA PRADESH	18.46%	18.46%	14.10%	13.08%
BIHAR	13.47%	17.37%	8.98%	8.08%
CHHATTISGARH	18.63%	26.09%	10.56%	17.08%
GUJARAT	20.30%	38.61%	14.36%	28.47%
HARYANA	27.57%	39.88%	17.01%	23.17%
JHARKHAND	13.71%	20.87%	9.35%	12.77%
KARNATAKA	23.58%	43.88%	15.82%	32.54%
KERALA	17.34%	31.37%	11.07%	19.93%
MADHYA PRADESH	22.26%	32.34%	14.54%	20.47%
MAHARASHTRA	23.79%	40.88%	14.55%	27.48%
ODISHA	13.42%	16.29%	10.22%	8.63%
PUNJAB	20.98%	32.46%	12.13%	24.92%
RAJASTHAN	17.14%	30.13%	10.91%	20.78%
TAMIL NADU	27.30%	43.10%	19.25%	25.86%
TELANGANA	40.79%	42.49%	29.18%	29.75%
UTTAR PRADESH	20.34%	33.05%	13.28%	19.77%
WEST BENGAL	16.33%	26.24%	11.37%	17.78%
HILL STATES				
ASSAM	19.63%	20.09%	15.98%	15.53%
HIMACHAL PRADESH	20.80%	35.84%	15.93%	24.34%
NORTH-EASTERN STATES (EXC. ASSAM)	14.50%	18.32%	12.98%	10.69%
UTTARAKHAND	30.99%	44.13%	20.19%	25.35%
UT & CITY STATES				
CHANDIGARH	18.92%	37.84%	14.41%	22.52%
DADRA & NAGAR HAVELI & DAMAN & DIU	33.33%	38.33%	27.86%	28.57%
GOA	25.14%	39.43%	18.29%	28.57%
JAMMU & KASHMIR	14.67%	30.43%	10.87%	18.48%
NEW DELHI	16.77%	41.32%	9.28%	23.05%
PUDUCHERRY	23.84%	26.74%	16.86%	15.70%
ALL-INDIA % PLUS STANDARD DEVIATION	28.11%	41.51%	19.92%	27.94%
ALL-INDIA % MINUS STANDARD DEVIATION	15.09%	23.37%	9.88%	14.62%

Best Performers
Above national average + standard deviation

Average Performers
Between national average + standard deviation and national average - standard deviation

Low Performers
Below national average - standard deviation

The data analysis has revealed a high and significant positive correlation between the share of firms that have engaged in innovation activities and the share of innovative firms by state. This correlation is observed to have a value of 0.914, highlighting the strong relationship between these two variables.

Similarly, a strong and significant relationship (correlation coefficient of 0.868) was also found between the share of firms investing in innovation activities and the share of innovators

by state. This highlights the positive impact of investment in innovation activities on the number of innovators within a given state.

These findings are depicted in Figures 5.7 and 5.8, which provide a visual representation of the correlation between the share of firms engaging in innovation activities and the share of innovative firms, and between the share of firms investing in innovation activities and the share of innovators, respectively.

FIGURE 5.7: Share of innovation-active firms (engaging in innovation activities) versus share of innovators by state

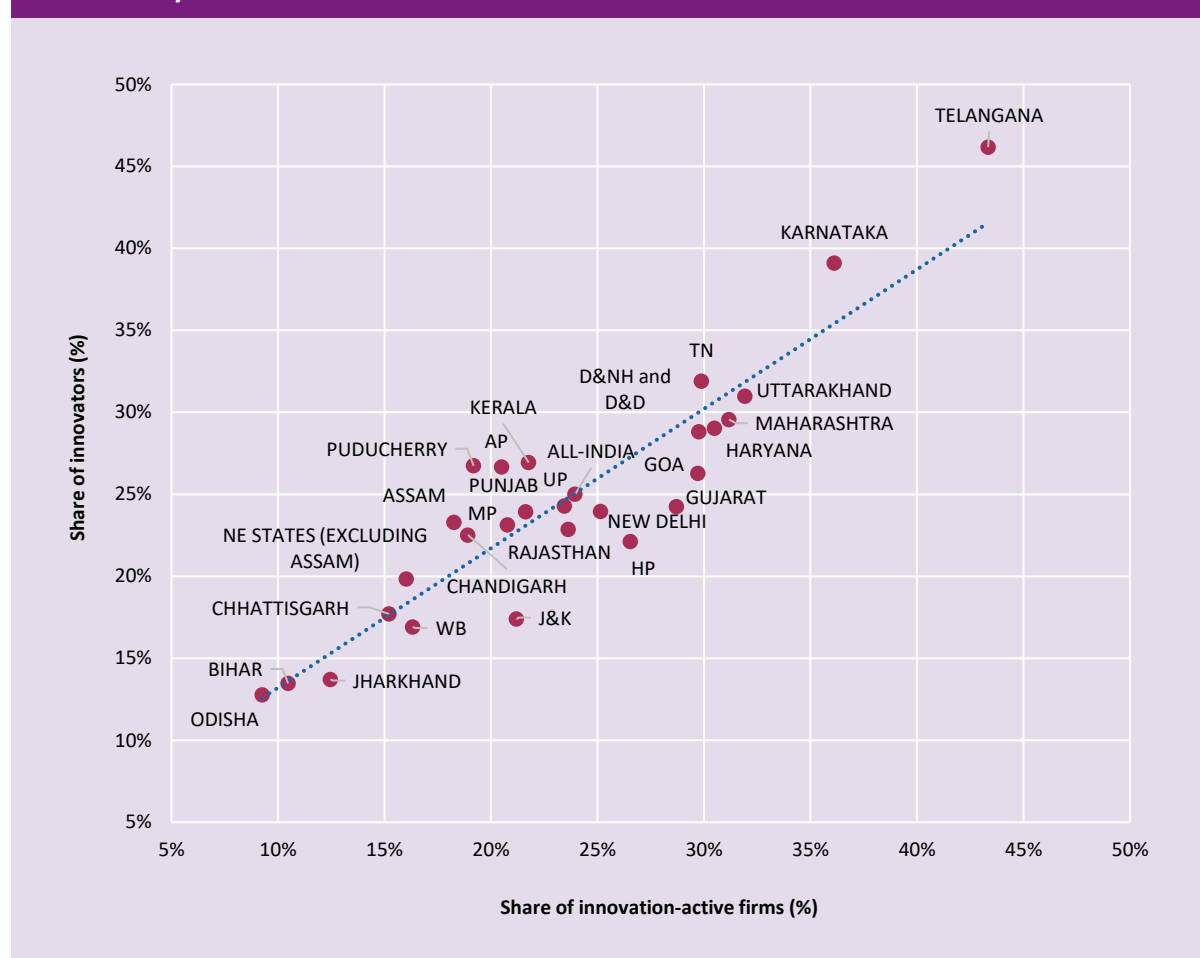
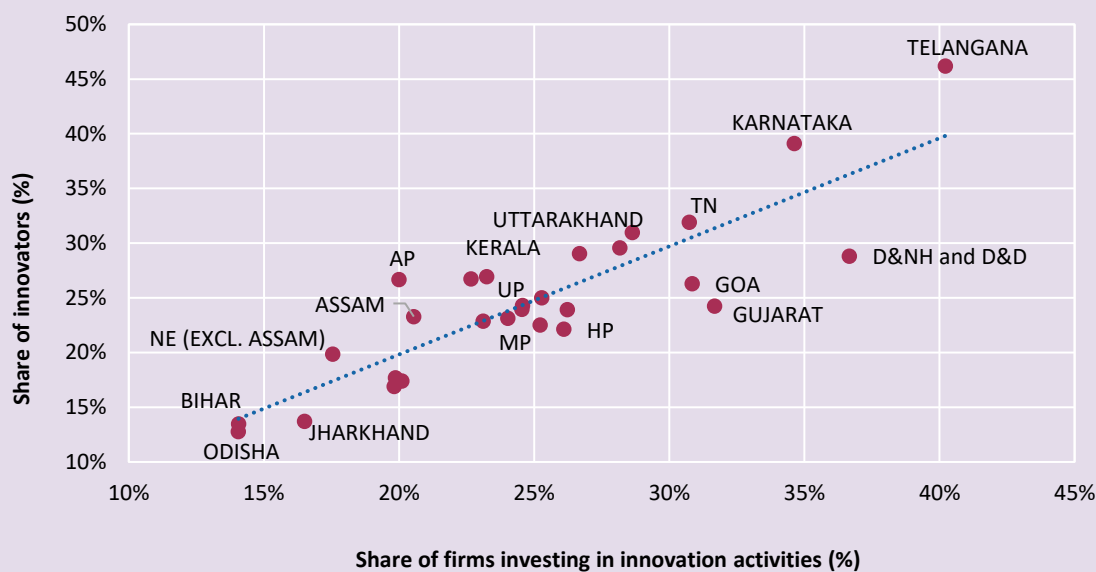


FIGURE 5.8: Share of firms investing in innovation activities versus share of innovators by state



The correlation between the share of firms engaged in tangible innovation activities and the share of innovative firms by state is significant and strong, as demonstrated by a correlation coefficient of 0.780, as shown in Figure 5.9. This

suggests a strong relationship between the proportion of firms engaging in tangible innovation activities and the proportion of firms that are considered innovative across states.

FIGURE 5.9: Share of firms engaged in tangible innovation activities versus share of innovators by state

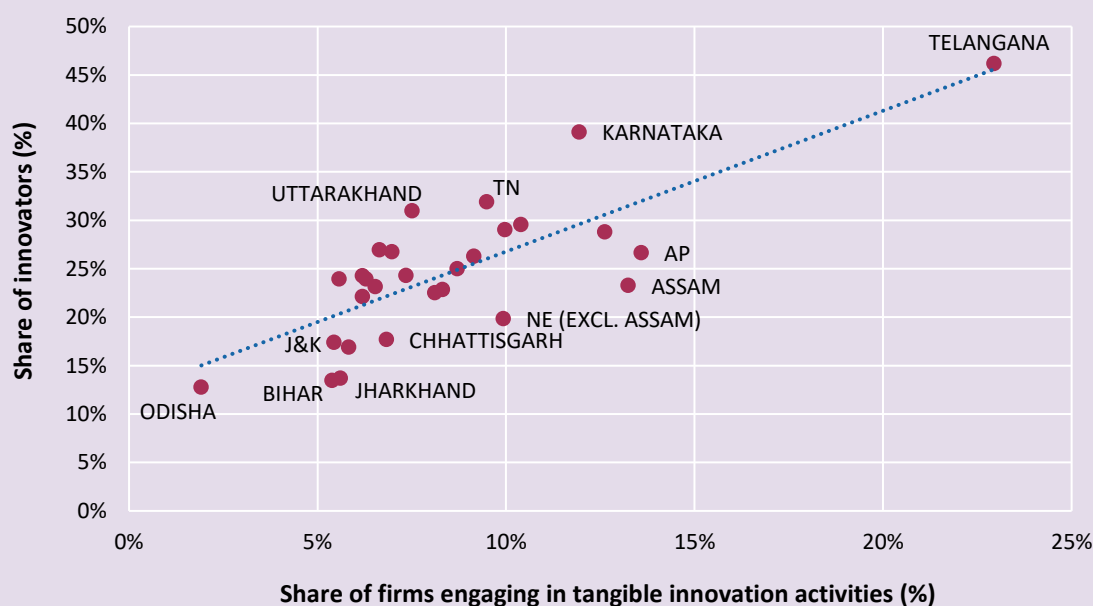
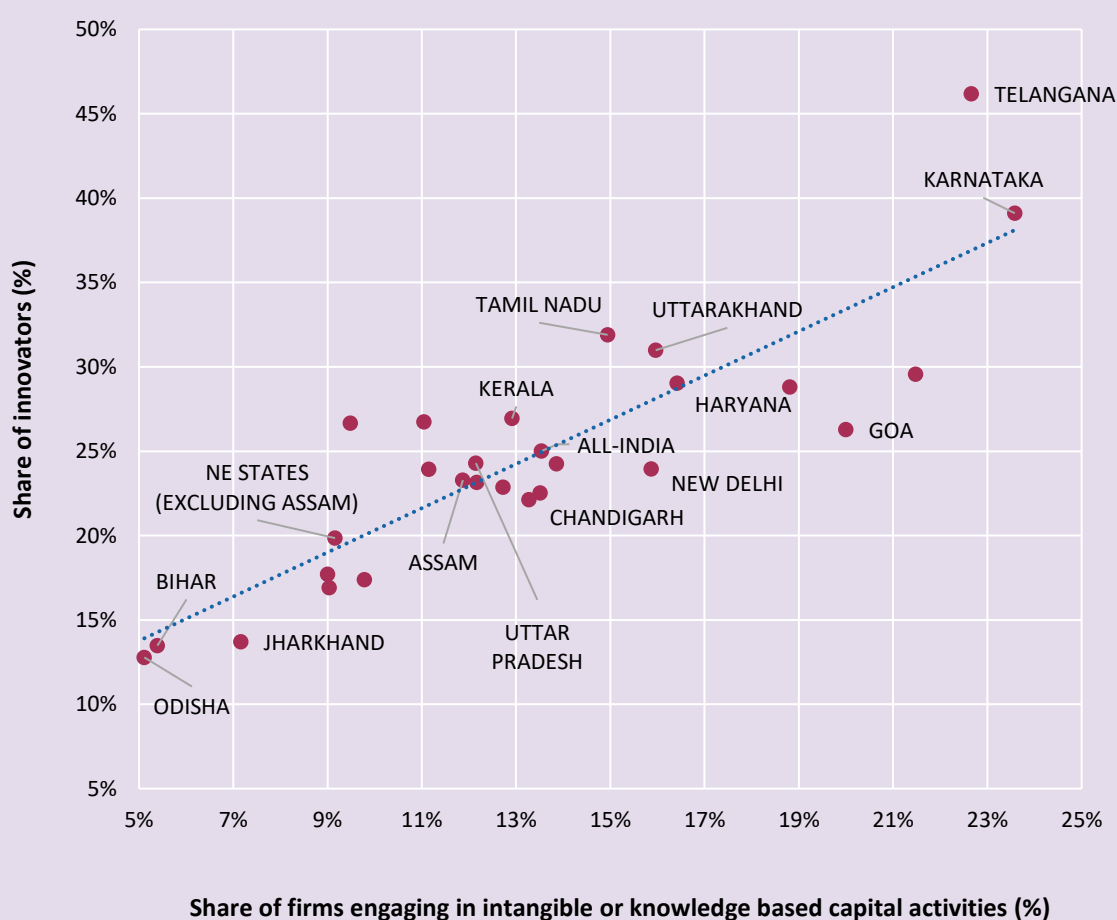


Figure 5.10 depicts a high and significant correlation (0.866) between the share of firms engaged in intangible or knowledge-based capital (KBC) activities and the share of innovative firms by state. The results reveal a higher correlation between KBC activities and

innovators compared to the correlation between tangible innovation activities and innovators (0.780). This highlights the significant impact of intangible assets on driving innovation in the business sector.

FIGURE 5.10: Success rates of innovation activities conducted in pursuit of innovation and regardless-of-purpose

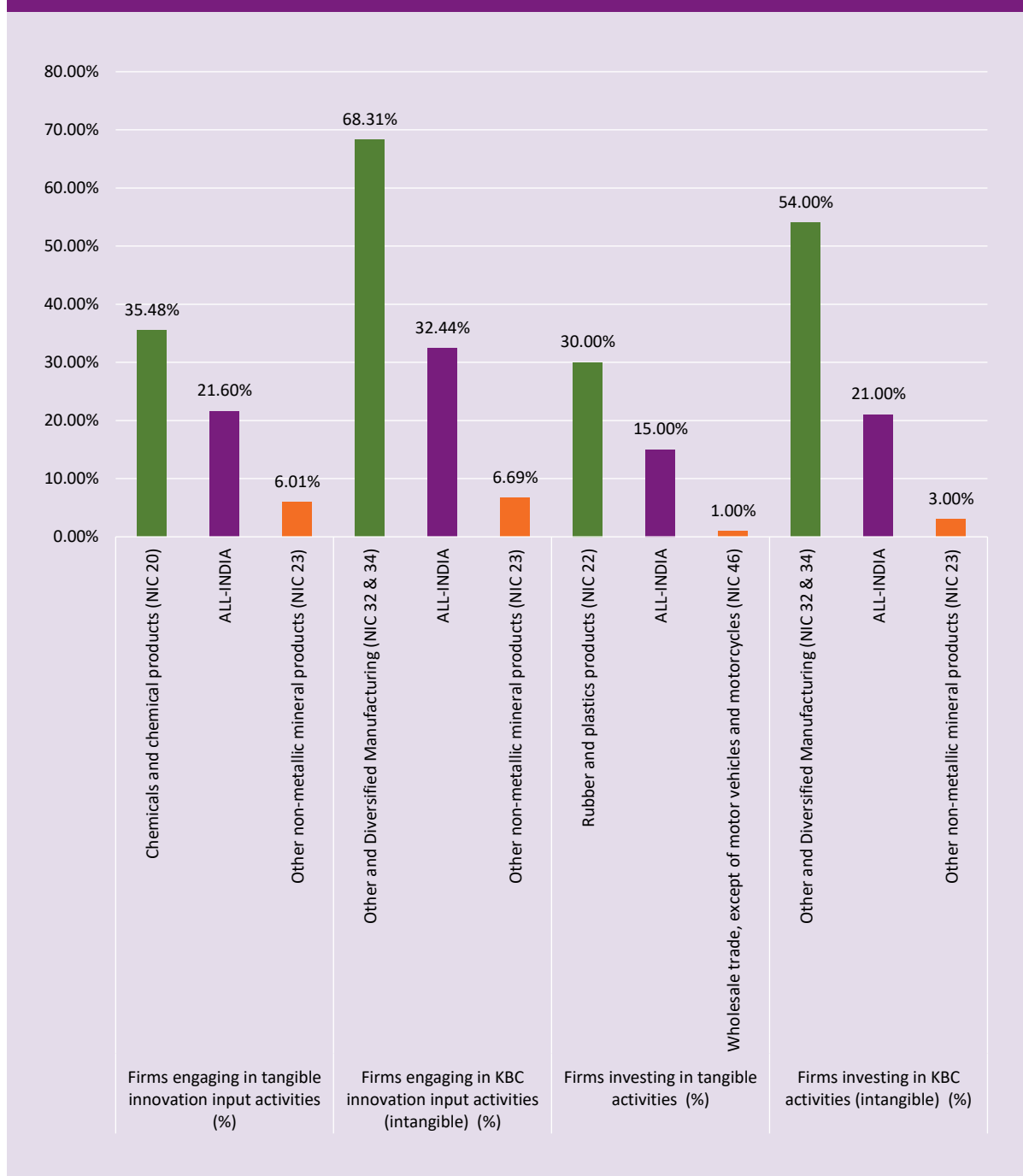


5.1.4. INNOVATION ACTIVITY & INVESTMENT BY FIRMS: SECTOR-WISE

Figure 5.11 presents a comparison of the percentage of firms in various sectors that engage in innovation activities or make investments in

tangible and intangible assets. Table 5.2 provides insight into the performance of different sectors regarding their engagement in tangible and knowledge-based capital (KBC) innovation input activities and investment in tangible and intangible assets.

FIGURE 5.11: Innovation activity & investment: sectors with the highest & least share of firms



As shown in figure 5.11 & table 5.2, in terms of **tangible innovation input activities**, the sectors with the highest share of firms are Chemicals and Chemical Products, Rubber and Plastics Products, Motor Vehicles, Trailers, and Semi-Trailers, and Other and Diversified Manufacturing, all with more than 30% of the firms engaging in such activities.

On the other hand, the sectors with the lowest share of firms are Other Non-Metallic Mineral Products, Wholesale Trade (except for Motor Vehicles and Motorcycles), and Wholesale and Retail Trade and Repair of Motor Vehicles and Motorcycles, with less than 10% of firms engaging in tangible innovation input activities.

For the **share of firms engaging in KBC innovation input activities**, the sectors with the highest share of firms are Other and Diversified Manufacturing, with a staggering 68.31% of firms engaged in such activities. Other sectors with the highest share of firms include Motor Vehicles, Trailers, Semi-Trailers, and Fabricated Metal Products, except Machinery and Equipment. The sectors with the lowest share of firms are Other Non-Metallic Mineral Products, Wholesale and Retail Trade and Repair of Motor Vehicles and Motorcycles, and Food and Beverages, with less than 23% of firms engaging in KBC innovation input activities.

When it comes to **investment in tangible assets**, the sectors with the highest share of firms are Rubber and Plastics Products, Other and Diversified Manufacturing, Machinery and Equipment, and Printing and Reproduction of Recorded Media. The sectors with the lowest share of firms are Wholesale Trade (except for Motor Vehicles and Motorcycles), Other Non-

Metallic Mineral Products, and Wholesale and Retail Trade and Repair of Motor Vehicles and Motorcycles, with less than 4% of firms reporting investment in tangible assets.

For **investment in KBC (intangible assets)**, the sectors with the highest share of firms are Other and Diversified Manufacturing, Fabricated Metal Products (except Machinery and Equipment), and Computer, Electronic, and Electrical Equipment. The sectors with the lowest share of firms are Other Non-Metallic Mineral Products, Wholesale and Retail Trade and Repair of Motor Vehicles and Motorcycles, and Wholesale Trade (except for Motor Vehicles and Motorcycles), with less than 7% of firms reporting investment in intangible assets.

Overall, the data highlights the importance of engaging in and investing in intangible assets and knowledge-based capital activities for the competitiveness and growth of different sectors.

TABLE 5.2: Innovation activity and investment: sectors with the best, average & lowest share of firms

STATES	FIRMS ENGAGING IN TANGIBLE INNOVATION INPUT ACTIVITIES	FIRMS ENGAGING IN KBC INNOVATION INPUT ACTIVITIES	FIRMS INVESTING IN TANGIBLE ACTIVITIES	FIRMS INVESTING IN KBC ACTIVITIES
ALL-INDIA	21.60%	32.44%	14.90%	21.28%
FOOD AND BEVERAGES (NIC 10 & 11)	21.04%	22.24%	16.38%	13.18%
TEXTILES AND APPARELS (NIC 13 & 14)	18.58%	35.91%	13.07%	27.24%
WOOD AND RELATED PRODUCTS (NIC 16)	21.43%	25.97%	11.69%	12.34%
PAPER AND RELATED PRODUCTS (NIC 17)	23.96%	34.03%	12.85%	19.10%
PRINTING AND REPRODUCTION OF RECORDED MEDIA (NIC 18)	28.71%	38.61%	25.74%	31.68%
CHEMICALS AND CHEMICAL PRODUCTS (NIC 20)	35.48%	46.77%	24.19%	34.10%
PHARMACEUTICALS, MEDICINAL CHEMICAL AND BOTANICAL PRODUCTS (NIC 21)	23.55%	42.47%	10.42%	20.46%
RUBBER AND PLASTICS PRODUCTS (NIC 22)	35.18%	35.04%	30.36%	26.72%
OTHER NON-METALLIC MINERAL PRODUCTS (NIC 23)	6.01%	6.69%	2.71%	3.10%
BASIC METALS (NIC 24)	15.75%	28.08%	10.05%	18.95%
FABRICATED METAL PRODUCTS, EXCEPT MACHINERY AND EQUIPMENT (NIC 25)	20.38%	48.20%	15.35%	39.81%
COMPUTER, ELECTRONIC AND ELECTRICAL EQUIPMENT (NIC 26 & 27)	30.81%	51.54%	20.73%	38.66%
MACHINERY AND EQUIPMENT (NIC 28)	31.56%	41.20%	25.91%	33.55%
MOTOR VEHICLES, TRAILERS AND SEMI-TRAILERS (NIC 29)	35.12%	54.76%	13.69%	27.98%
OTHER AND DIVERSIFIED MANUFACTURING (NIC 32 & 34)	33.88%	68.31%	28.42%	53.55%
WHOLESALE AND RETAIL TRADE AND REPAIR OF MOTOR VEHICLES AND MOTORCYCLES (NIC 45)	9.52%	15.48%	3.57%	5.36%
WHOLESALE TRADE, EXCEPT OF MOTOR VEHICLES AND MOTORCYCLES (NIC 46)	8.62%	47.84%	1.29%	6.90%
ALL-INDIA % PLUS STANDARD DEVIATION	31.27%	47.65%	23.91%	35.01%
ALL-INDIA % MINUS STANDARD DEVIATION	11.93%	17.23%	5.89%	7.55%

Best Performers

Above national average + standard deviation

Average Performers

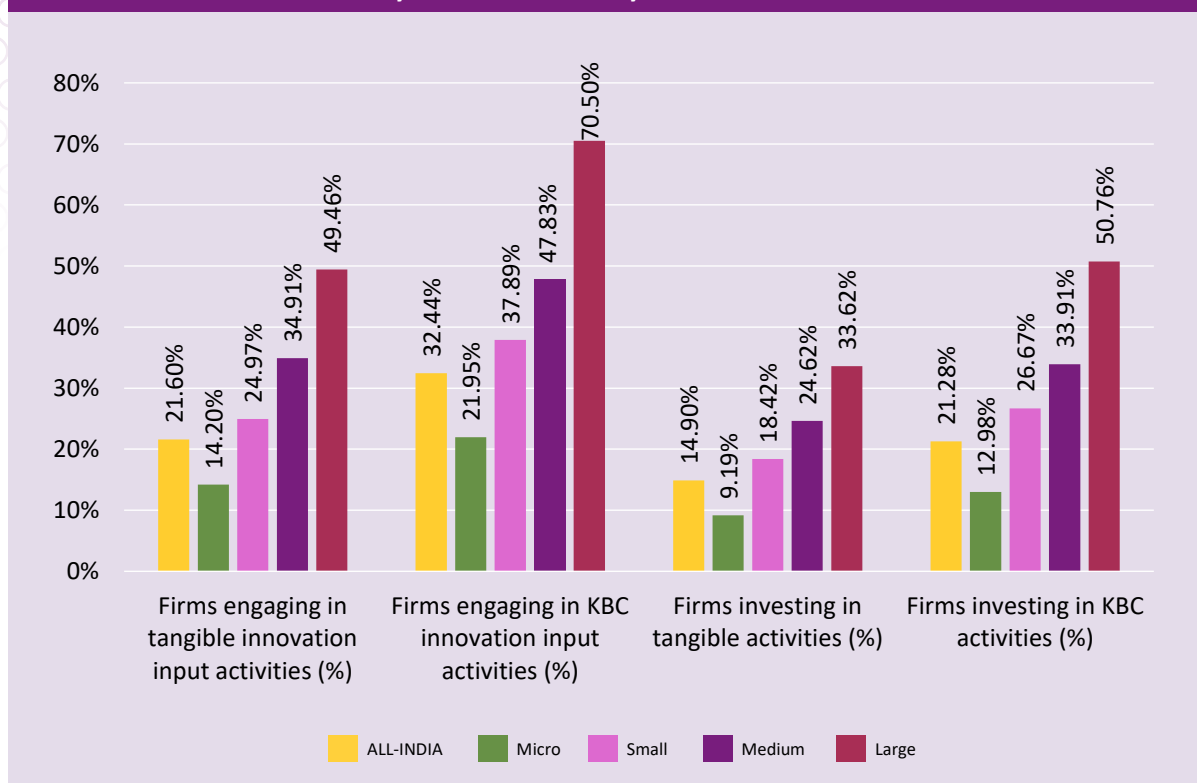
Between national average + standard deviation and national average - standard deviation

Low Performers

Below national average - standard deviation

5.1.5. INNOVATION ACTIVITY & INVESTMENT BY FIRMS: SIZE-WISE

FIGURE 5.12: Innovation activity and investment by firm size



The graph displays the distribution of firms' engagement in innovation input activities and asset investment across different size bins. The data suggests that the majority of firms participating in both tangible and intangible innovation input activities and investment in assets belong to the large and medium-size bins, whereas the small-size bin contributes a relatively lower percentage.

With regards to the **share of firms engaging in tangible innovation input activities**, 49.46% of large-size firms and 34.91% of medium-size firms have reported such engagement. Meanwhile, only 24.97% of small-size firms and 4.20% of micro-size firms have reported engagement in these activities.

In terms of the **share of firms engaging in KBC innovation input activities**, the largest proportion, 70.50%, is reported by large-size firms, followed by 47.83% reported by medium-size firms. On the other hand, only 37.89% of small-size firms and 1.95% of micro-size firms reported engagement in these activities.

Regarding **investment in tangible assets**, 34% of large-size firms, 25% of medium-size firms, 18% of small-size firms and 9% of micro-size firms reported such investment. For **investment in KBC (intangible assets)**, 51% of large-size firms, 34% of medium-size firms, 27% of small-size firms and 13% of micro-size firms reported such investment. In conclusion, the trend suggests that larger firms tend to participate in innovation input activities and make investments in assets more often compared to smaller firms.

Engagement and Investment in innovation activities by firm size

FIGURE 5.13: Engagement in innovation activities by firm size

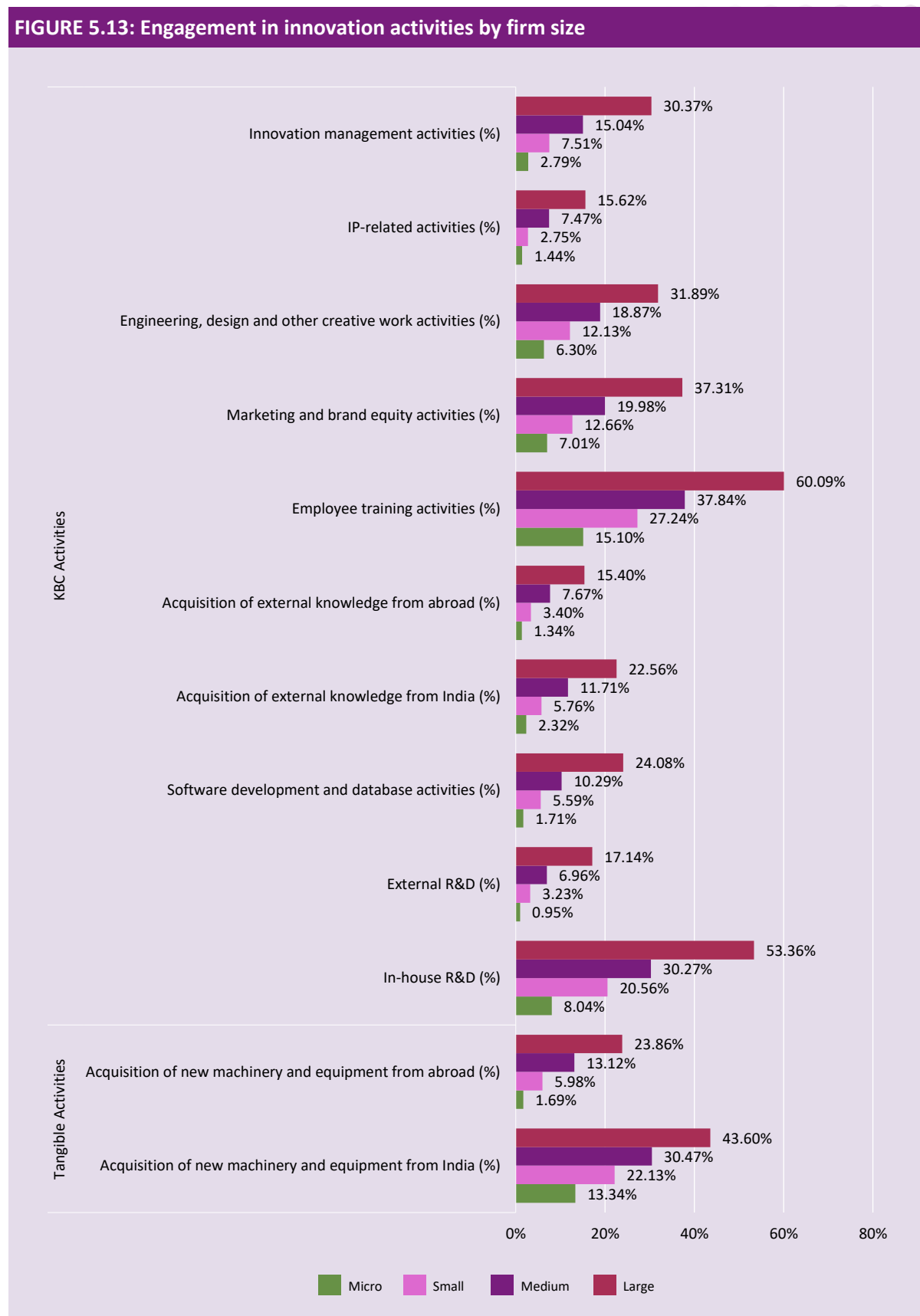
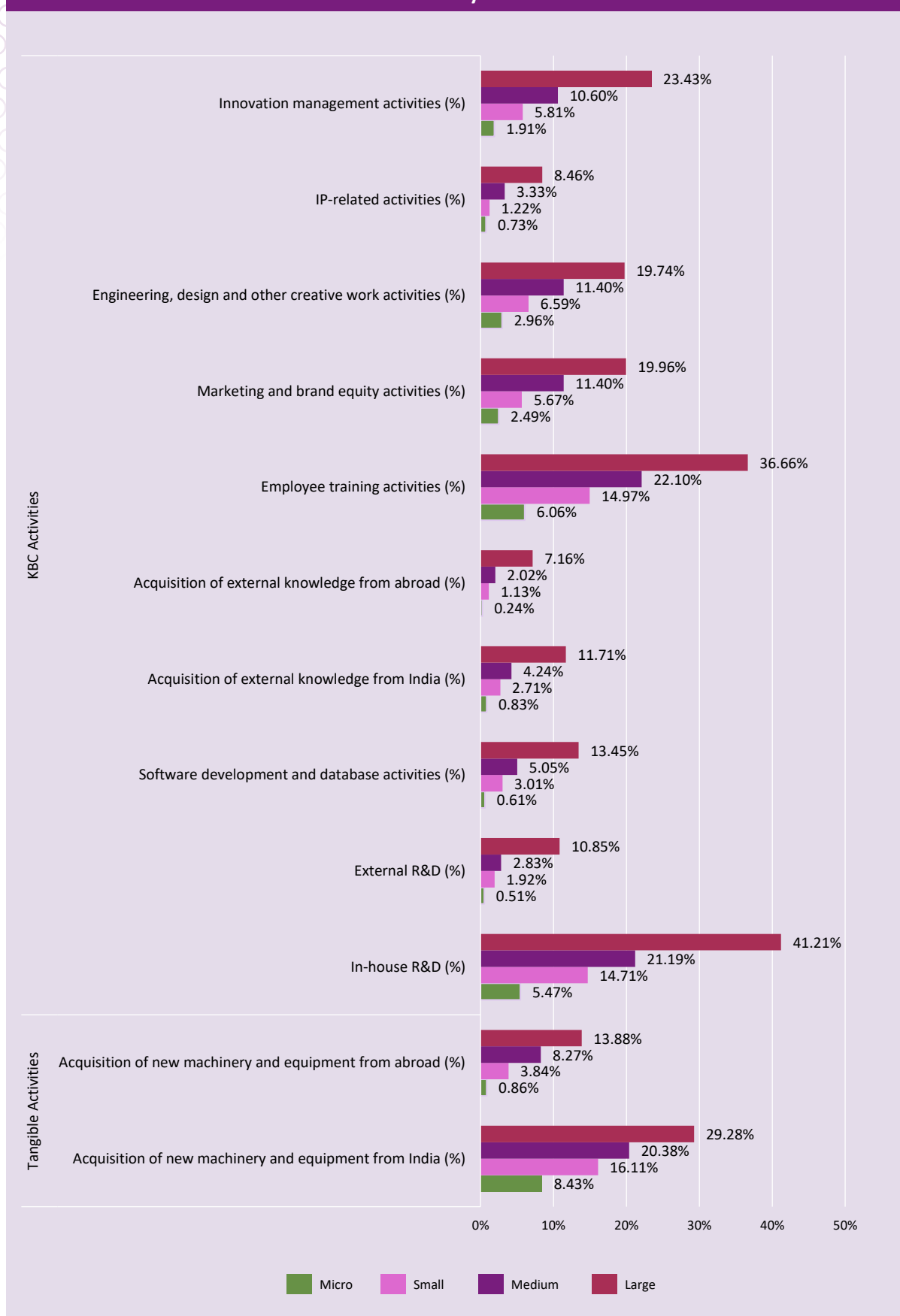


FIGURE 5.14: Investment in innovation activities by firm size



Large firms have a higher share of engagement in all activities conducted in pursuit of innovation, as depicted in Figure 5.13. While micro and small firms have engaged mainly in in-house R&D, acquisition of new plant, machinery or equipment from India and employee training activities, medium and large size firms have engaged in in-house R&D, acquisition of new plant, machinery or equipment from India and innovation management activities. However, the investment differences between small and medium firms are not large, both in tangible and non-tangible activities. While the turnover differences between these two groups are significant, it is important to recognise the slowing down of investments in medium-size firms, especially noticeable in the differences between medium and large firms.

From the above data, only 2.32% and 1.34% of micro firms engaged in the acquisition of external knowledge from India and abroad, respectively. This is in comparison to 22.56% and 15.40% of large firms. While 68% and 73% of micro firms engaged in the acquisition of external knowledge from India and abroad, respectively, were successful in introducing innovations in the market, 96% and 95% of large firms did well.

Investment in innovation activities is also low across firm sizes. For instance, 41.21% of large firms have invested in in-house R&D compared to 21.19%, 14.71% and 5.47% of respectively medium, small and micro-size bins as shown in Figure 5.14.

5.2. INNOVATION CAPABILITIES

Innovation Capabilities Pillar consists of eleven indicators: Share of firms with internal sources of financing, share of firms with funding available for training, share of firms with R&D staff, share of firms using innovative tools and practices among staff that are successful, share of firms employing highly qualified personnel, by level of educational attainment, share of firms employing/engaging experts in advanced digital tools in house, share of firms highly satisfied with innovation capabilities of employees, share of firms using advanced, enabling or emerging technologies, share of firms making use of internal information sources for innovation, share of firms with an R&D strategy and share of firms with an I4.0 strategy. The below graph depicts the percentage of top performing state, the all-India average and least performing state.

FIGURE 5.15: Share of firms reporting innovation capabilities versus share of such firms successful in introducing innovations



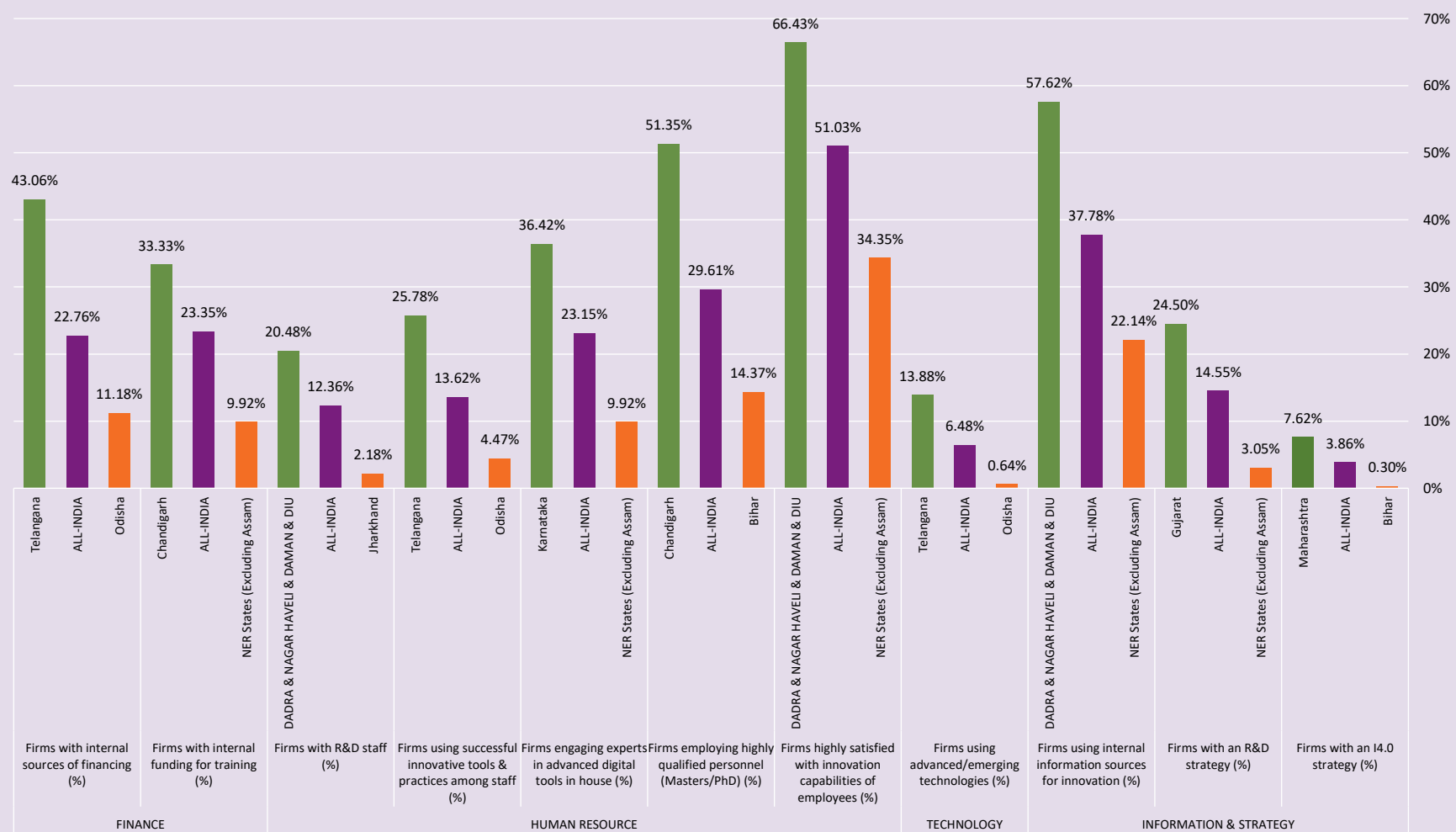
Figure 5.15 shows the share of firms reporting these capabilities versus the share of firms that were successful in producing product or business processes. The most successful innovation capability was staff using innovative tools within the firm (78.18%), even though the share of firms with this capability was only 13.62%. Having an Industry 4.0 strategy to guide the management of the firm is one of the most successful (70.83%) yet the least common (3.86%) innovation capability among manufacturing firms. The other more successful innovation capabilities are having an R&D strategy (62.89%), internal sources of financing

(62.59%) and using advanced and enabling technologies (61.38%).

5.2.1. INNOVATION CAPABILITIES OF FIRMS: STATE-WISE

Figure 5.16 provides an overview of the all-India share and the states with the highest and least share of firms reporting indicators related to innovation capabilities, and Table 5.3, provides a categorisation of various states into three categories, based on the share of firms reporting indicators under the innovation capabilities pillar.

FIGURE 5.16: Innovation capabilities: states with the highest & least share of firms



Innovation capabilities: states with the best, average, and lowest share of firms

The table's best performer category includes states with a higher share of firms reporting under a particular indicator than the all-India share *plus* the standard deviation of that indicator. In contrast, the low performer category includes states with a share of firms reporting under an indicator lower than the all-India share *minus* the standard deviation of that indicator. The average performer category represents states with the share of firms reporting under a specific indicator falling within the all-India share *plus* standard deviation and the all-India share *minus* the standard deviation.

The states of Dadra & Nagar Haveli and Daman & Diu, Maharashtra, and Karnataka stand out as having the highest share of firms across most of the indicators. Furthermore, among all the indicators, firms employing/ engaging experts in advanced digital tools in house had the highest number of best performing states (13).



Internal sources of financing: best and low performers

The national average for firms with internal sources of financing is 22.76%, while the states with the highest share of firms are Telangana (43.06%), Karnataka (30.75%), and Gujarat (30.20%). In contrast, Odisha (11.18%), Bihar (11.98%), North-Eastern states (excluding Assam) (14.50%), and Jharkhand (14.95%) have the lowest share of such firms.



Internal funding available for training: best and low performers

The states with the highest share of firms with internal funding available for training are

Chandigarh (33.33%), Telangana (33.14%), Uttarakhand (31.92%), and Maharashtra (30.95%), while the North-Eastern states (excluding Assam) (9.92%), Odisha (11.82%), Jharkhand (12.46%), and West Bengal (13.99%) have the lowest share of such firms.



Share of firms with R&D staff: best and low performers

States with the highest share of firms with R&D staff are Dadra & Nagar Haveli and Daman & Diu (20.48%), Uttarakhand (19.72%), Himachal Pradesh (18.14%), and Maharashtra (17.32%), while Jharkhand (2.18%), Bihar (3.59%), North-Eastern states (excluding Assam) (6.87%), and Rajasthan (7.01%) have the lowest share of such firms.



Firms using innovative tools and practices among staff: best and low performers

The states with the highest share of firms using innovative tools and practices among staff that are successful are Telangana (25.78%) and Karnataka (22.99%), while Odisha (4.47%), Bihar (6.59%), West Bengal (6.71%), Punjab (7.21%), and Jharkhand (8.10%) have the lowest share of such firms.



Firms using advanced digital tools in-house: best and low performers

Karnataka (36.42%), Maharashtra (32.33%), and Haryana (29.33%) have the highest share of firms using advanced digital tools in-house, while the North-Eastern states (excluding Assam) (9.92%), Bihar (11.38%), Assam (13.24%), Andhra Pradesh (13.59%), Jharkhand (13.71%), and Odisha (13.74%) have the lowest share of such firms.



Firms employing highly qualified personnel by level of educational attainment: best and low performers

Chandigarh (51.35%), New Delhi (45.21%), Maharashtra (40.65%) and Karnataka (38.51%) have the highest share of firms employing highly qualified personnel by level of educational attainment, while Bihar (14.37%), Punjab (20.00%), Jharkhand (20.25%), and Andhra Pradesh (21.03%) have the lowest share of such firms.



Firms with highly satisfied with their employees' innovation capabilities: best and low performers

Dadra & Nagar Haveli and Daman & Diu (66.43%), Gujarat (62.87%), Maharashtra (60.74%), Karnataka (60.00%), and Telangana (59.77%) have the highest share of firms highly satisfied with their employees' innovation capabilities, while North-Eastern states (excluding Assam) (34.35%), Assam (36.99%), Odisha (38.66%), and Punjab (40.66%) have the lowest share of such firms.



Firms using advanced, enabling, or emerging technologies: best and low performers

Telangana (13.88%) and Maharashtra (11.09%) have the highest share of firms using advanced, enabling, or emerging technologies, while Odisha (0.64%), Bihar (0.90%), North-Eastern states (excluding Assam) (2.29%), and Andhra Pradesh (2.56%) have the lowest share of such firms.



Firms making use of internal information sources: best and low performers

The national average reported for firms making use of internal information sources for innovation is 37.78%, with the highest share of firms located in Dadra & Nagar Haveli and Daman & Diu (57.62%), Gujarat (51.24%), Karnataka (49.85%), Maharashtra (46.88%). However, the lowest share of firms is located in North-Eastern states (excluding Assam) (22.14%), followed by Andhra Pradesh (23.33%), Assam (23.74%), Odisha (24.92%), and Bihar (27.25%).



Firms with an R&D strategy: best and low performers

For firms with an R&D strategy, the national average is 14.55%, with the highest share of firms in Gujarat (24.50%), Karnataka (22.99%), Maharashtra (21.48%), and Himachal Pradesh (20.80%), and the lowest share of firms in North-Eastern states (excluding Assam) (3.05%), Odisha (3.51%), Bihar (5.09%), and Jharkhand (5.92%).



Firms with an I4.0 strategy: best and low performers

Additionally, for firms with an I4.0 strategy, the national average reported is 3.86%, with the highest share of firms in Maharashtra (7.62%), Karnataka (6.87%), Haryana (6.16%), and Telangana (5.95%), and the lowest share of firms in Bihar (0.30%), Odisha (0.32%), North-Eastern states (excluding Assam) (0.76%), Andhra Pradesh (1.28%), and Jharkhand (1.56%).

TABLE 5.3: Innovation capabilities: states with the best, average & lowest share of firms

States	Finance		Human Resources					Technology	Information & Strategy		
	Firms with internal sources of financing	Firms with internal funding for training	Firms with R&D staff	Firms using successful innovative tools & practices among staff	Firms engaging experts in advanced digital tools in house	Firms employing highly qualified personnel (Masters/PhD)	Firms highly satisfied with innovation capabilities of employees	Firms using advanced/emerging technologies	Firms using internal information sources for innovation	Firms with an R&D strategy	Firms with an I4.0 strategy
All-India	22.76%	23.35%	12.36%	13.62%	23.15%	29.61%	51.03%	6.48%	37.78%	14.55%	3.86%
MAJOR STATES											
Andhra Pradesh	20.77%	16.92%	9.49%	11.54%	13.59%	21.03%	48.97%	2.56%	23.33%	8.46%	1.28%
Bihar	11.98%	16.47%	3.59%	6.59%	11.38%	14.37%	41.62%	0.90%	27.25%	5.09%	0.30%
Chhattisgarh	18.01%	22.36%	9.01%	8.70%	18.63%	26.71%	50.31%	4.04%	36.34%	12.11%	2.80%
Gujarat	30.20%	26.49%	14.60%	15.59%	28.96%	35.40%	62.87%	7.43%	51.24%	24.50%	3.47%
Haryana	24.93%	27.86%	15.25%	17.60%	29.33%	32.26%	53.08%	7.33%	37.54%	17.01%	6.16%
Jharkhand	14.95%	12.46%	2.18%	8.10%	13.71%	20.25%	41.74%	3.12%	32.71%	5.92%	1.56%
Karnataka	30.75%	28.96%	13.43%	22.99%	36.42%	38.51%	60.00%	6.87%	49.85%	22.99%	6.87%
Kerala	23.62%	23.62%	14.02%	11.44%	25.46%	28.78%	53.14%	8.12%	42.80%	11.07%	2.58%
Madhya Pradesh	20.18%	24.04%	10.09%	10.68%	22.85%	29.08%	49.55%	4.75%	38.28%	12.46%	3.26%
Maharashtra	26.10%	30.95%	17.32%	17.32%	32.33%	40.65%	60.74%	11.09%	46.88%	21.48%	7.62%
Odisha	11.18%	11.82%	8.31%	4.47%	13.74%	24.28%	38.66%	0.64%	24.92%	3.51%	0.32%
Punjab	18.36%	18.03%	8.20%	7.21%	19.02%	20.00%	40.66%	4.59%	30.82%	11.48%	3.28%
Rajasthan	23.38%	20.52%	7.01%	13.25%	20.78%	22.60%	51.43%	7.27%	35.58%	12.21%	3.38%
Tamil Nadu	25.57%	26.72%	13.79%	17.24%	27.01%	35.06%	58.62%	9.20%	40.23%	16.95%	5.75%
Telangana	43.06%	33.14%	14.16%	25.78%	24.08%	28.05%	59.77%	13.88%	46.46%	17.28%	5.95%
Uttar Pradesh	18.36%	21.75%	12.71%	9.60%	22.03%	27.12%	43.22%	5.65%	35.03%	12.99%	3.11%
West Bengal	16.91%	13.99%	11.95%	6.71%	18.66%	33.53%	41.98%	3.21%	27.99%	10.20%	2.04%
HILL STATES											
Assam	18.72%	16.89%	10.96%	12.79%	13.24%	24.66%	36.99%	5.48%	23.74%	10.96%	2.74%
Himachal Pradesh	21.24%	29.65%	18.14%	15.04%	26.55%	35.84%	56.19%	6.64%	35.84%	20.80%	4.42%
North-Eastern States (Exc. Assam)	14.50%	9.92%	6.87%	12.98%	9.92%	26.72%	34.35%	2.29%	22.14%	3.05%	0.76%
Uttarakhand	26.76%	31.92%	19.72%	17.37%	24.88%	29.58%	49.30%	6.57%	33.80%	20.19%	3.76%
UT & CITY STATES											
Chandigarh	23.42%	33.33%	18.92%	10.81%	32.43%	51.35%	48.65%	9.01%	33.33%	18.92%	5.41%
Dadra & Nagar Haveli & Daman & Diu	32.14%	29.52%	20.48%	20.00%	29.76%	30.95%	66.43%	9.29%	57.62%	24.29%	4.76%
Goa	26.29%	32.00%	17.71%	15.43%	34.29%	35.43%	57.14%	8.00%	42.86%	18.86%	6.29%
Jammu & Kashmir	13.59%	17.39%	12.50%	9.24%	18.48%	22.28%	38.04%	3.80%	38.04%	14.13%	3.26%
New Delhi	22.75%	28.14%	16.17%	18.56%	30.24%	45.21%	54.79%	12.28%	43.41%	14.97%	7.19%
Puducherry	22.09%	23.26%	9.88%	13.95%	20.93%	26.74%	49.42%	6.98%	34.88%	13.95%	4.65%
All-India % Plus Standard Deviation	29.70%	30.42%	17.13%	18.82%	30.60%	37.82%	59.76%	9.76%	46.77%	20.65%	5.95%
All-India % Minus Standard Deviation	15.82%	16.28%	7.59%	8.42%	15.70%	21.40%	42.30%	3.20%	28.79%	8.45%	1.77%

Best Performers
Above national average + standard deviation

Average Performers
Between national average + standard deviation and national average - standard deviation

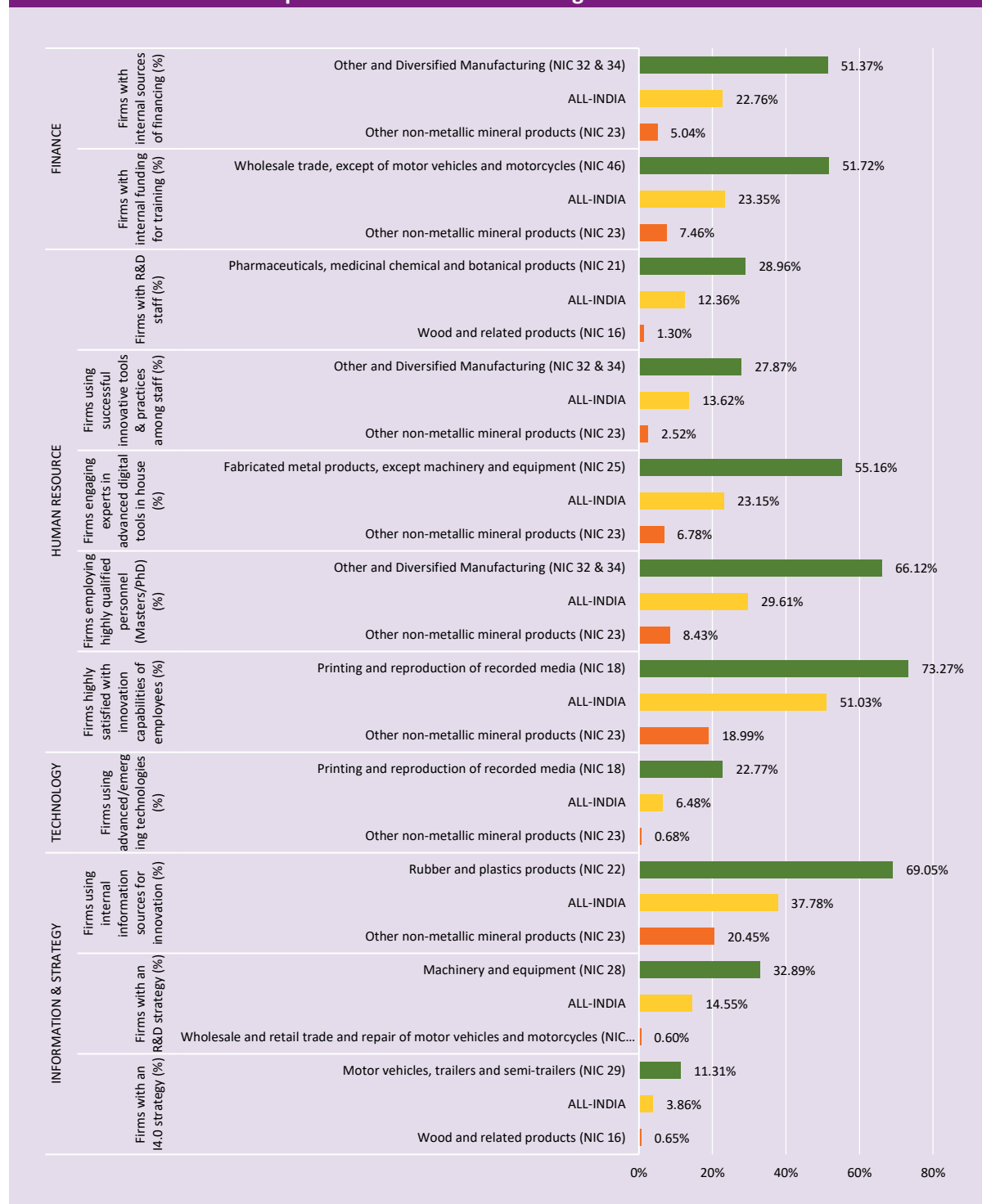
Low Performers
Below national average - standard deviation

5.2.2. INNOVATION CAPABILITIES OF FIRMS: SECTOR-WISE

Figure 5.17 provides an overview of the all-India share and the sectors with the highest and least share of firms reporting indicators related to innovation capabilities, and Table 5.4, provides a

categorisation of various sectors into three categories, based on the share of firms reporting indicators under the innovation capabilities pillar.

FIGURE 5.17: Innovation capabilities: sectors with the highest & least share of firms



Innovation capabilities: sectors with the best, average and lowest share of firms

The sectors like other and diversified manufacturing, machinery and equipment, and chemicals and chemical products stand out as having the highest share of firms across most of the indicators. Furthermore, among all the indicators, firms using innovative tools and practices among staff that are successful, firms employing/engaging experts in advanced digital tools in house had the highest number of best performing sectors (5).



Internal financing sources: best and low performers

In terms of internal financing sources, the sectors with the highest share of firms are other and diversified manufacturing at 51.37%, followed by fabricated metal products, except machinery and equipment at 44.60%, printing and reproduction of recorded media at 41.58% and rubber and plastics products at 36.64%. Conversely, the sectors with the lowest share of firms utilizing internal financing sources are other non-metallic mineral products at 5.04%, followed by wholesale and retail trade and repair of motor vehicles and motorcycles at 6.55%.



Internal funding available for training: best and low performers

In the context of firms with internal funding available for training, wholesale trade, except of motor vehicles and motorcycles has the highest share of firms at 51.72%, followed by other and diversified manufacturing at 37.70% and chemicals and chemical products at 36.18%. On the other hand, other non-metallic mineral

products have the lowest share of firms at 7.46%.



Firms with R&D staff: best and low performers

Pharmaceuticals, medicinal chemical and botanical products has the highest share of firms at 28.96%, followed by chemicals and chemical products at 26.04%, other and diversified manufacturing at 24.04% and machinery and equipment at 22.59%. Conversely, the sectors with the lowest share of firms utilizing R&D staff are wood and related products at 1.30%, followed by other non-metallic mineral products at 2.52%.



Firms using innovative tools and practices among staff that are successful: best and low performers

Other and diversified manufacturing has the highest share of firms at 27.87%, followed by printing and reproduction of recorded media at 26.73%, chemicals and chemical products at 25.58%, machinery and equipment at 25.25%, and computer, electronic and electrical equipment at 23.25%. Conversely, other non-metallic mineral products has the lowest share of firms at 2.52%.



Firms employing/engaging experts in advanced digital tools in-house: best and low performers

Fabricated metal products, except machinery and equipment has the highest share of firms at 55.16%, followed by other and diversified manufacturing at 50.82%, computer, electronic and electrical equipment at 39.78%, machinery and equipment at 39.53% and motor vehicles,

trailers and semi-trailers at 38.69%. Conversely, the sectors with the lowest share of firms utilizing advanced digital tools in-house are other non-metallic mineral products at 6.78%, followed by food and beverages at 8.66% and wholesale and retail trade and repair of motor vehicles and motorcycles at 8.93%.



Firms employing highly qualified personnel, by level of educational attainment: best and low performers

Other and diversified manufacturing has the highest share of firms at 66.12%, followed by wholesale trade, except motor vehicles and motorcycles at 60.78%, and fabricated metal products, except machinery and equipment at 50.84%. Conversely, the sectors with the lowest share of firms employing highly qualified personnel are other non-metallic mineral products at 8.43%, followed by wood and related products at 11.04%.



Firms highly satisfied with innovation capabilities of employees: best and low performers

Printing and reproduction of recorded media has the highest share of firms (73.27%), followed by machinery and equipment (71.43%), chemicals and chemical products (70.05%) and other and diversified Manufacturing at 69.40%. Conversely, other non-metallic mineral products has the lowest share of firms (18.99%), followed by wholesale trade (except for motor vehicles and motorcycles) (25.00%), wholesale and retail trade and repair of motor vehicles and motorcycles (27.98%).

Firms using advanced, enabling, or emerging technologies: best and low performers Sectors with the highest share of are printing and reproduction of recorded media (22.77%), machinery and equipment (14.95%) and wholesale trade, except of motor vehicles and motorcycles at 13.36% and sector with lowest share is other non-metallic mineral products at 0.68%.



Firms making use of internal information sources for innovation: best and low performers

The sectors with the highest share are rubber and plastics products (69.05%), followed by machinery and equipment (66.45%), chemicals and chemical products (65.21%), and other and diversified Manufacturing (64.48%). On the other hand, the sectors with the lowest share of firms making use of internal information sources for innovation are Other non-metallic mineral products (20.45%).



Firms with an R&D strategy: best and low performers

Finally, the sectors with the highest share of are machinery and equipment (32.89%), followed by chemicals and chemical products (31.57%), computer, electronic and electrical equipment (30.81%), and pharmaceuticals, medicinal chemical and botanical products (28.96%). On the other hand, the sectors with the lowest share of firms with an I4.0 strategy are other non-metallic mineral products (0.68%), followed by wood and related products (0.65%).

TABLE 5.4: Innovation capabilities: sectors with the best, average & lowest share of firms

States	Finance		Human Resources					Technology	Information & Strategy		
	Firms with internal sources of financing	Firms with internal funding for training	Firms with R&D staff	Firms using successful innovative tools & practices among staff	Firms engaging experts in advanced digital tools in house	Firms employing highly qualified personnel (Masters/PhD)	Firms highly satisfied with innovation capabilities of employees	Firms using advanced/emerging technologies	Firms using internal information sources for innovation	Firms with an R&D strategy	Firms with an I4.0 strategy
All-India	22.76%	23.35%	12.36%	13.62%	23.15%	29.61%	51.03%	6.48%	37.78%	14.55%	3.86%
Food and Beverages (NIC 10 & 11)	15.91%	19.37%	10.99%	9.92%	8.66%	29.23%	56.06%	3.20%	26.30%	9.45%	1.53%
Textiles and Apparels (NIC 13 & 14)	26.93%	23.46%	16.69%	15.75%	23.62%	33.86%	57.01%	3.62%	35.91%	11.97%	2.52%
Wood and related products (NIC 16)	22.73%	13.64%	1.30%	11.04%	23.38%	11.04%	34.42%	3.90%	40.26%	2.60%	0.65%
Paper and related products (NIC 17)	24.31%	30.90%	4.17%	11.81%	25.69%	13.89%	46.53%	7.99%	44.79%	9.38%	4.51%
Printing and reproduction of recorded media (NIC 18)	41.58%	25.74%	6.93%	26.73%	31.68%	22.77%	73.27%	22.77%	46.53%	6.93%	5.94%
Chemicals and chemical products (NIC 20)	35.25%	36.18%	26.04%	25.58%	30.65%	44.47%	70.05%	8.99%	65.21%	31.57%	5.53%
Pharmaceuticals, medicinal chemical and botanical products (NIC 21)	23.94%	30.50%	28.96%	12.36%	24.32%	40.93%	52.51%	7.34%	27.80%	28.96%	5.79%
Rubber and plastics products (NIC 22)	36.64%	28.76%	17.81%	18.83%	28.47%	32.70%	64.23%	9.34%	69.05%	22.63%	5.40%
Other non-metallic mineral products (NIC 23)	5.04%	7.46%	2.52%	2.52%	6.78%	8.43%	18.99%	0.68%	20.45%	3.39%	0.68%
Basic metals (NIC 24)	15.75%	24.43%	5.94%	10.27%	21.92%	25.57%	44.98%	6.16%	23.29%	9.59%	2.28%
Fabricated metal products, except machinery and equipment (NIC 25)	44.60%	17.99%	13.91%	10.79%	55.16%	50.84%	65.47%	3.60%	51.56%	17.27%	2.64%
Computer, Electronic and Electrical Equipment (NIC 26 & 27)	19.05%	21.85%	17.09%	23.25%	39.78%	25.21%	59.94%	10.36%	37.82%	30.81%	7.56%
Machinery and equipment (NIC 28)	35.55%	30.90%	22.59%	25.25%	39.53%	39.20%	71.43%	14.95%	66.45%	32.89%	10.96%
Motor vehicles, trailers and semi-trailers (NIC 29)	23.21%	28.57%	14.29%	15.48%	38.69%	27.38%	52.38%	10.12%	27.38%	23.81%	11.31%
Other and Diversified Manufacturing (NIC 32 & 34)	51.37%	37.70%	24.04%	27.87%	50.82%	66.12%	69.40%	8.74%	64.48%	21.31%	6.01%
Wholesale and retail trade and repair of motor vehicles and motorcycles (NIC 45)	6.55%	16.67%	5.36%	6.55%	8.93%	22.02%	27.98%	5.36%	22.02%	0.60%	2.38%
Wholesale trade, except of motor vehicles and motorcycles (NIC 46)	12.93%	51.72%	4.74%	8.19%	31.03%	60.78%	25.00%	13.36%	28.02%	5.60%	5.60%
All-India % Plus Standard Deviation	35.97%	33.66%	21.15%	21.42%	36.73%	45.92%	68.13%	11.79%	54.75%	25.62%	7.03%
All-India % Minus Standard Deviation	9.55%	13.04%	3.57%	5.82%	9.57%	13.30%	33.93%	1.17%	20.81%	3.48%	0.69%

Best Performers

Above national average + standard deviation

Average Performers

Between national average + standard deviation and national average - standard deviation

Low Performers

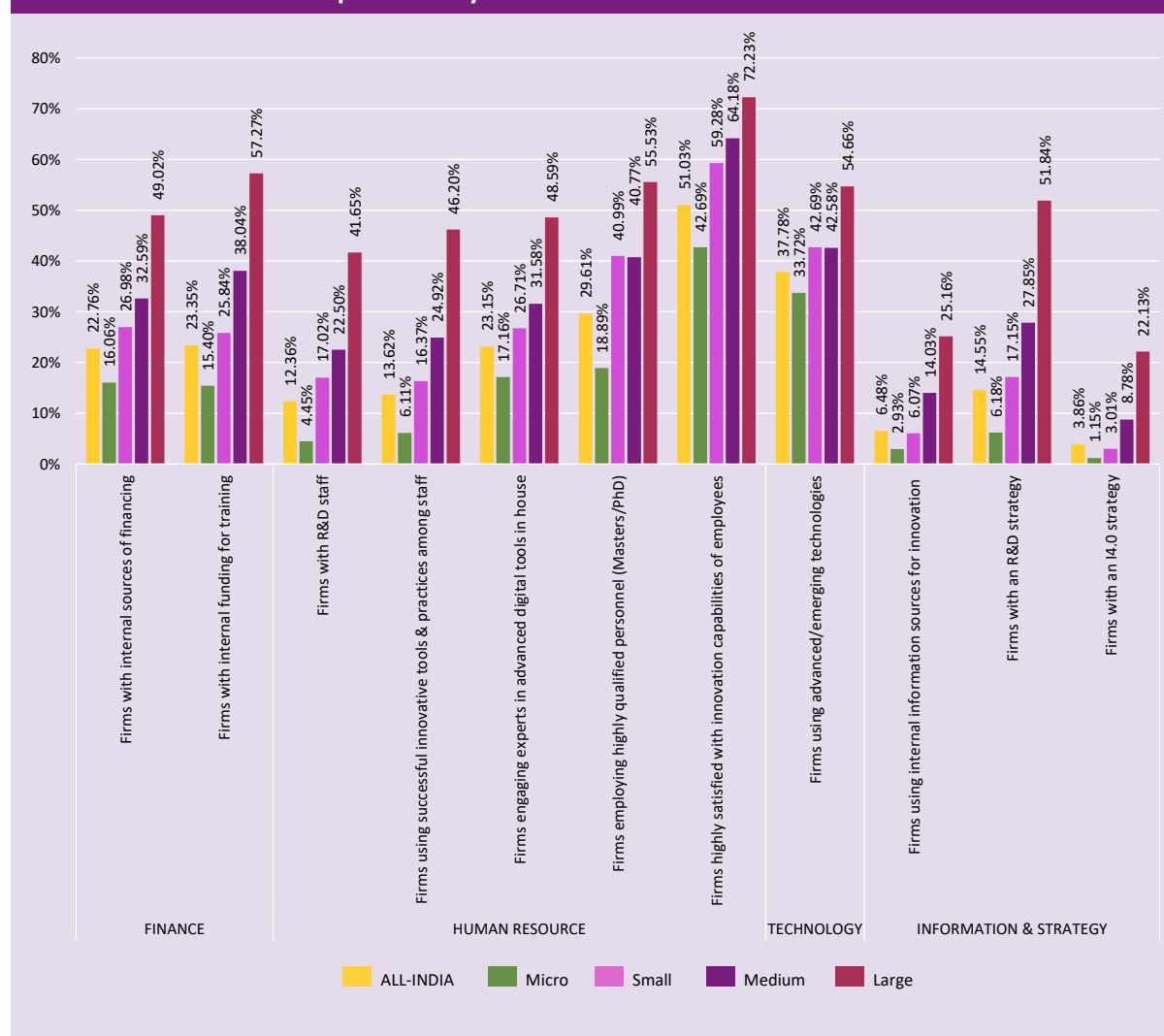
Below national average - standard deviation

5.2.3. INNOVATION CAPABILITIES OF FIRMS: SIZE WISE

The Figure 5.18 provides insights into the distribution of various indicators across different size bins. According to the data, 49.02% of firms

in the large size bin have internal sources of financing, while only 16.06% of firms in the micro size bin have the same. Similarly, 57.27% of firms in the large size bin have funding available for training, while only 15.40% of firms in the micro size bin have access to it.

FIGURE 5.18: Innovation capabilities by firm size



In terms of firms with **R&D staff**, the data shows that 41.65% of firms in the large size bin have such staff, while only 4.45% of firms in the micro size bin have the same. The data also indicates that 46.20% of firms in the large size bin use **innovative tools and practices among staff that are successful**, while

only 6.11% of firms in the micro size bin have access to the same. Regarding firms **employing/engaging experts in advanced digital tools in-house**, the data shows that 48.59% of firms in the large size bin do so, while only 17.16% of firms in the micro size bin have the same capability. Similarly, 55.53% of firms

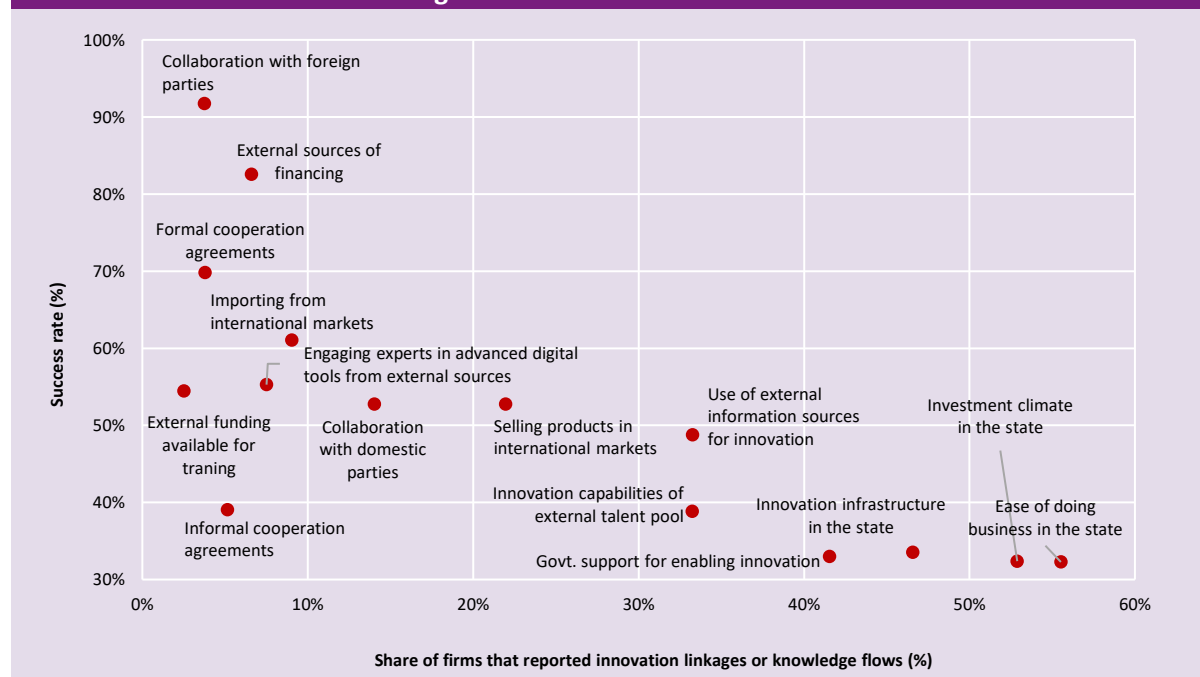
in the large size bin **employ highly qualified personnel**, while only 18.89% of firms in the micro size bin have the same level of educational attainment.

Furthermore, the data suggests that 72.23% of firms in the large size bin are highly satisfied with **innovation capabilities of employees**, while only 42.69% of firms in the micro size bin report the same level of satisfaction. In terms of firms using **advanced, enabling, or emerging technologies**, the data shows that 54.66% of firms in the large size bin use such technologies, while only 33.72% of firms in the micro size bin have access to the same. 25.16% of large firms use internal information sources while 2.93% of micro firms use the same. Finally, the data indicates that 51.84% of firms in the large size bin have an **R&D strategy**, while only 6.18% of firms in the micro size bin have the same. Additionally, only 22.13% of firms in the large size bin have an **I4.0 strategy**, while only 1.15% of firms in the micro size bin have such a strategy in place.

5.3. INNOVATION LINKAGES & KNOWLEDGE FLOWS

Figure 5.19 shows the success versus frequency rate of innovation linkages and knowledge flows at the all-India level. Success of each of the indicators is defined by the share of firms that were innovative (introduced innovations) out of the firms that reported each indicator under linkages and knowledge flows. Frequency is the share of firms that reported an innovation linkage or knowledge flow. While the most reported linkages and knowledge flows are high satisfaction with ease of doing business, investment and infrastructure climate, the most successful linkages and knowledge flows have been collaboration with foreign parties, external sources of financing and formal cooperation agreements.

FIGURE 5.19: Share of firms reporting innovation linkages & knowledge flows versus share of such firms successful in introducing innovations



5.3.1. INNOVATION ECOSYSTEM FOR FIRMS: STATE-WISE

The survey had queried each firm about the state-level innovation infrastructure, investment-climate and ease of doing business to draw an understanding of the innovation ecosystem available to firm within the states they functioned.

Innovation ecosystem consists of 5 indicators as shown in the above graph: Share of firms highly satisfied with the investment climate in the state, share of firms highly satisfied with ease of doing business in the state, share of firms highly satisfied with govt. support for enabling innovation, share of firms highly satisfied with innovation infrastructure in the state, share of firms highly satisfied with innovation capabilities of external talent pool. The above graph depicts the % of state with highest & lowest share of firms for each indicator.

FIGURE 5.20: Satisfaction of the innovation ecosystem: states with the highest & least share of firms

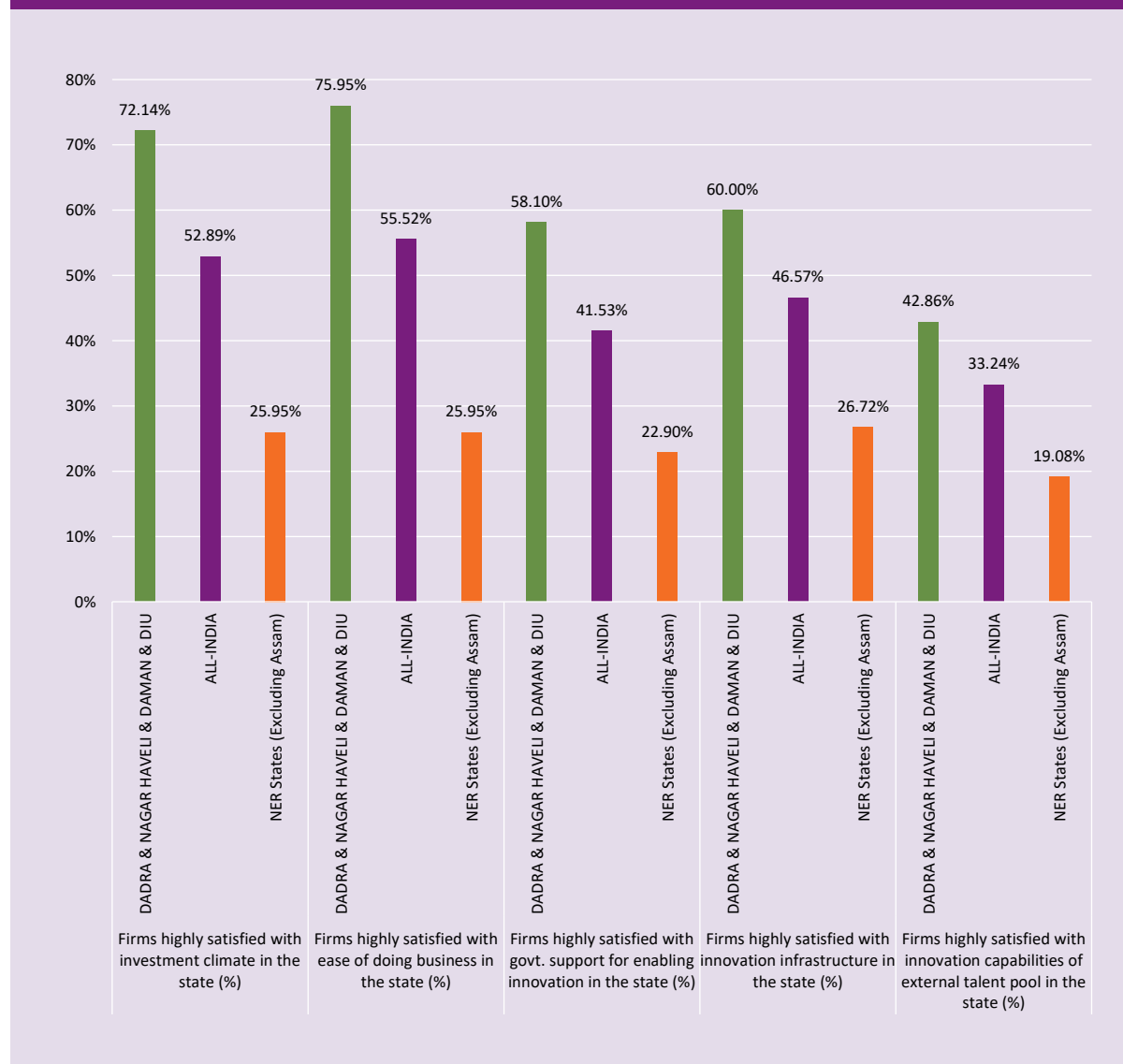


Figure 5.20 provides an overview of the all-India share and the states with the highest and least share of firms reporting indicators related to innovation ecosystem, and Table 5.5, provides a categorisation of various states into three categories, based on the share of firms reporting indicators under the innovation ecosystem pillar.

Innovation ecosystem: states with the best, average and lowest share of firms

The table's best performer category includes states with a higher share of firms reporting under a particular indicator than the all-India share *plus* the standard deviation of that indicator. In contrast, the low performer category includes states with a share of firms reporting under an indicator lower than the all-India share *minus* the standard deviation of that indicator. The average performer category represents states with the share of firms reporting under a specific indicator falling within the all-India share *plus* standard deviation and the all-India share *minus* the standard deviation.

The states of Dadra & Nagar Haveli and Daman & Diu and Gujarat stand out as having the highest share of firms across most of the indicators. Furthermore, among all the indicators, firms highly satisfied with innovation capabilities of external talent pool had the highest number of best performing states (4).



Firms highly satisfied with the investment climate in the state: best and low performers

The national average reported for firms highly satisfied with the investment climate is 52.89%. However, Dadra & Nagar Haveli and Daman & Diu (72.14%), followed by Gujarat (68.07%) have the highest share of firms highly satisfied with the

investment climate. On the other hand, the North-Eastern states (Exc. Assam) (25.95%) have the lowest share of firms highly satisfied with the investment climate, followed by Assam (37.44%), Odisha (38.66%), Bihar (41.02%), Jammu and Kashmir (41.30%), Punjab (41.31%), and Andhra Pradesh (42.31%).



Firms highly satisfied with the ease of doing business in the state: best and low performers

Similarly, the national average reported for firms highly satisfied with the ease of doing business is 55.52%. Dadra & Nagar Haveli and Daman & Diu (75.95%) and Gujarat (69.80%) have the highest share of firms highly satisfied with the ease of doing business. In contrast, the North-Eastern states (Exc. Assam) (25.95%), Assam (36.99%), Bihar (40.72%), Odisha (42.81%) and Andhra Pradesh (44.36%) have the lowest share of firms highly satisfied with the ease of doing business.



Firms highly satisfied with government support for enabling innovation in the state: best and low performers

Furthermore, the data reveals that the national average reported for firms highly satisfied with government support for enabling innovation is 41.53%. Dadra & Nagar Haveli and Daman & Diu (58.10%), Gujarat (55.20%), New Delhi (51.50%) have the highest share of firms highly satisfied with government support for enabling innovation. On the other hand, the North-Eastern states (Exc. Assam) (22.90%), followed by Assam (25.11%), Jammu & Kashmir (27.72%), Bihar (27.54%), and Punjab (29.51%) have the lowest share of firms highly satisfied with government support for enabling innovation.



Firms highly satisfied with innovation infrastructure in the state: best and low performers

Additionally, the data shows that the national average reported for firms highly satisfied with innovation infrastructure in the state is 46.57%. Dadra & Nagar Haveli and Daman & Diu (60.00%), Gujarat (58.91%), New Delhi (58.38%) have the highest share of firms highly satisfied with innovation infrastructure. In contrast, the North-Eastern states (Exc. Assam) (26.72%), followed by Jammu & Kashmir (29.35%), Bihar (32.34%), Assam (32.88%), Punjab (34.75%), Jharkhand (37.07%), and Odisha (37.06%) have the lowest share of firms highly satisfied with innovation infrastructure.



Firms highly satisfied with innovation capabilities of the external talent pool in the state: best and low performers

Lastly, the national average reported for firms highly satisfied with the innovation capabilities of the external talent pool is 33.24%. Dadra & Nagar Haveli and Daman & Diu (42.86%), followed by Maharashtra (41.57%), Telangana (40.79%), and Gujarat (40.35%) have the highest share of firms highly satisfied with the innovation capabilities of the external talent pool. On the other hand, the North-Eastern states (Exc. Assam) (19.08%), followed by Jammu & Kashmir (22.28%), West Bengal (21.87%), Uttar Pradesh (24.01%), Punjab (24.59%), and Chandigarh (26.13%) have the lowest share of firms highly satisfied with the innovation capabilities of the external talent pool.

TABLE 5.5: Innovation ecosystem: states with the best, average & lowest share of firms

States	Firms highly satisfied with investment climate in the state	Firms highly satisfied with ease of doing business in the state	Firms highly satisfied with govt. support for enabling innovation in the state	Firms highly satisfied with innovation infrastructure in the state	Firms highly satisfied with innovation capabilities of external talent pool in the state
All-India	52.89%	55.52%	41.53%	46.57%	33.24%
MAJOR STATES					
Andhra Pradesh	42.31%	44.36%	34.36%	40.26%	32.31%
Bihar	41.02%	40.72%	27.54%	32.34%	27.84%
Chhattisgarh	51.86%	55.28%	45.34%	50.62%	29.81%
Gujarat	68.07%	69.80%	55.20%	58.91%	40.35%
Haryana	52.79%	54.84%	42.23%	44.57%	35.19%
Jharkhand	44.86%	46.42%	35.20%	37.07%	28.04%
Karnataka	60.60%	63.28%	46.27%	53.43%	38.21%
Kerala	62.73%	63.84%	47.23%	54.61%	34.69%
Madhya Pradesh	53.71%	56.97%	40.36%	48.96%	30.86%
Maharashtra	60.51%	61.43%	50.12%	51.96%	41.57%
Odisha	38.66%	42.81%	32.59%	37.06%	28.12%
Punjab	41.31%	48.85%	29.51%	34.75%	24.59%
Rajasthan	54.03%	55.58%	44.42%	49.35%	32.47%
Tamil Nadu	59.48%	62.64%	48.85%	55.17%	35.34%
Telangana	55.52%	57.51%	36.54%	47.59%	40.79%
Uttar Pradesh	45.20%	47.74%	36.16%	40.96%	24.01%
West Bengal	46.36%	51.90%	37.61%	42.27%	21.87%
HILL STATES					
Assam	37.44%	36.99%	25.11%	32.88%	29.68%
Himachal Pradesh	57.52%	59.73%	48.67%	54.87%	38.50%
North-Eastern States (Exc. Assam)	25.95%	25.95%	22.90%	26.72%	19.08%
Uttarakhand	56.34%	59.15%	43.66%	46.01%	38.03%
UT & CITY STATES					
Chandigarh	50.45%	51.35%	40.54%	44.14%	26.13%
Dadra & Nagar Haveli & Daman & Diu	72.14%	75.95%	58.10%	60.00%	42.86%
Goa	56.00%	62.86%	47.43%	53.71%	39.43%
Jammu & Kashmir	41.30%	45.65%	27.72%	29.35%	22.28%
New Delhi	62.87%	64.37%	51.50%	58.38%	39.82%
Puducherry	58.14%	63.37%	36.63%	41.28%	37.79%
All-India % plus standard deviation	63.38%	66.40%	50.81%	56.04%	40.09%
All-India % minus standard deviation	42.39%	44.65%	32.25%	37.10%	26.39%

Best Performers

Above national average + standard deviation

Average Performers

Between national average + standard deviation and national average - standard deviation

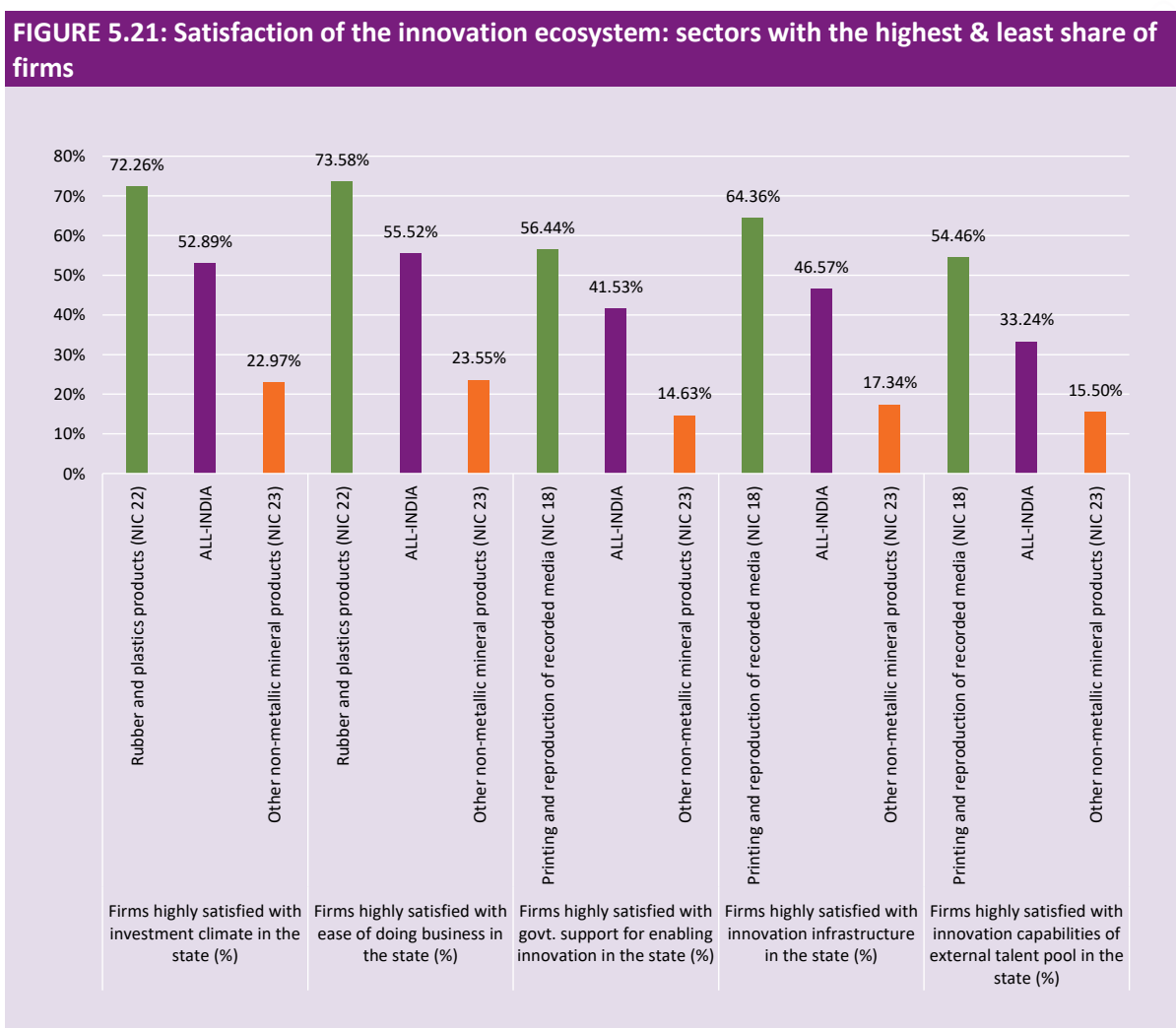
Low Performers

Below national average - standard deviation

5.3.2. INNOVATION ECOSYSTEM FOR FIRMS: SECTOR-WISE

The Figure 5.21 provides an overview of the all-India share and the sectors with the highest and least share of firms reporting indicators related

to innovation ecosystem, and Table 5.6, provides a categorization of various sectors into three categories, based on the share of firms reporting indicators under the innovation ecosystem pillar.



Innovation ecosystem: the best and low performers across sectors

The sectors like printing and reproduction of recorded media, and machinery and equipment stand out as having the highest share of firms across most of the indicators. Furthermore, among all the indicators firms highly satisfied

with ease of doing business in the had the highest number of best performing sectors (4).



Firms highly satisfied with investment climate in the state: best and low performers

According to the data presented in Figure 5.21 and Table 5.6, the investment climate, the sectors with the highest share of firms highly

satisfied are rubber and plastics products with 72.26%, chemicals and chemical products with 69.59%, and machinery and equipment with 69.44. The sectors with the lowest share of firms highly satisfied is other non-metallic mineral products with 22.97%, wood and related products with 29.22% and wholesale trade, except of motor vehicles and motorcycles with 34.05%.



Firms highly satisfied with ease of doing business in the state: best and low performers

In terms of ease of doing business, rubber and plastics products and machinery and equipment are the sectors with the highest share of firms highly satisfied, with 73.58% and 72.43%, respectively along with chemicals and chemical products with 71.66% and printing and reproduction of recorded media with 71.29%. On the other hand, other non-metallic mineral products and wood and related products have the lowest share of firms highly satisfied, with 23.55% and 33.12%, respectively and wholesale trade, except of motor vehicles and motorcycles with 37.50%.



Firms highly satisfied with government support for enabling innovation in the state: best and low performers

When it comes to government support for enabling innovation, printing and reproduction of recorded media and machinery and equipment have the highest share of firms highly

satisfied, with 56.44% and 56.15% respectively. Meanwhile, Other non-metallic mineral products and wood and related products have the lowest share of firms highly satisfied, with 14.63% and 16.88%, respectively.



Firms highly satisfied with innovation infrastructure in the state: best and low performers

Furthermore, innovation infrastructure has been evaluated, and the sectors with the highest share of firms highly satisfied are printing and reproduction of recorded media and machinery and equipment, with 64.36% and 62.13%, respectively. On the other hand, other non-metallic mineral products and wood and related products have the lowest share of firms highly satisfied, with 17.34% and 25.32%, respectively.



Firms highly satisfied with innovation capabilities of external talent pool in the state: best and low performers

Printing and reproduction of recorded media, other and diversified manufacturing and chemicals and chemical products have the highest share of firms highly satisfied, with 54.46%, 49.18%, and 46.77%, respectively. Conversely, wood and related products, other non-metallic mineral products, wholesale trade, except of motor vehicles and motorcycles, and wholesale and retail trade and repair of motor vehicles and motorcycles have the lowest share of firms highly satisfied, with 16.23%, 15.50%, 19.40%, and 20.24%, respectively.

TABLE 5.6: Innovation ecosystem: sectors with the best, average & lowest share of firms

States	Firms highly satisfied with investment climate in the state	Firms highly satisfied with ease of doing business in the state	Firms highly satisfied with govt. support for enabling innovation in the state	Firms highly satisfied with innovation infrastructure in the state	Firms highly satisfied with innovation capabilities of external talent pool in the state
All-India	52.89%	55.52%	41.53%	46.57%	33.24%
Food and Beverages (NIC 10 & 11)	54.26%	56.52%	46.54%	52.66%	36.88%
Textiles and Apparels (NIC 13 & 14)	58.43%	60.63%	51.18%	54.96%	40.63%
Wood and related products (NIC 16)	29.22%	33.12%	16.88%	25.32%	16.23%
Paper and related products (NIC 17)	48.26%	53.82%	28.13%	39.24%	31.94%
Printing and reproduction of recorded media (NIC 18)	66.34%	71.29%	56.44%	64.36%	54.46%
Chemicals and chemical products (NIC 20)	69.59%	71.66%	55.30%	59.22%	46.77%
Pharmaceuticals, medicinal chemical, and botanical products (NIC 21)	56.37%	58.69%	45.95%	49.42%	38.61%
Rubber and plastics products (NIC 22)	72.26%	73.58%	51.82%	54.31%	39.56%
Other non-metallic mineral products (NIC 23)	22.97%	23.55%	14.63%	17.34%	15.50%
Basic metals (NIC 24)	53.65%	54.57%	43.61%	47.49%	28.31%
Fabricated metal products, except machinery and equipment (NIC 25)	63.31%	65.23%	53.24%	59.95%	22.30%
Computer, Electronic and Electrical Equipment (NIC 26 & 27)	61.62%	69.19%	49.58%	60.50%	40.34%
Machinery and equipment (NIC 28)	69.44%	72.43%	56.15%	62.13%	44.52%
Motor vehicles, trailers and semi-trailers (NIC 29)	54.17%	64.88%	39.29%	42.86%	31.55%
Other and Diversified Manufacturing (NIC 32 & 34)	58.47%	61.20%	50.82%	51.91%	49.18%
Wholesale and retail trade and repair of motor vehicles and motorcycles (NIC 45)	39.88%	45.83%	26.79%	32.74%	20.24%
Wholesale trade, except of motor vehicles and motorcycles (NIC 46)	34.05%	37.50%	25.86%	31.90%	19.40%
All-India % plus standard deviation	67.39%	70.21%	55.53%	60.41%	45.25%
All-India % minus standard deviation	38.39%	40.83%	27.53%	32.73%	21.23%

Best Performers

Above national average + standard deviation

Average Performers

Between national average + standard deviation and national average - standard deviation

Low Performers

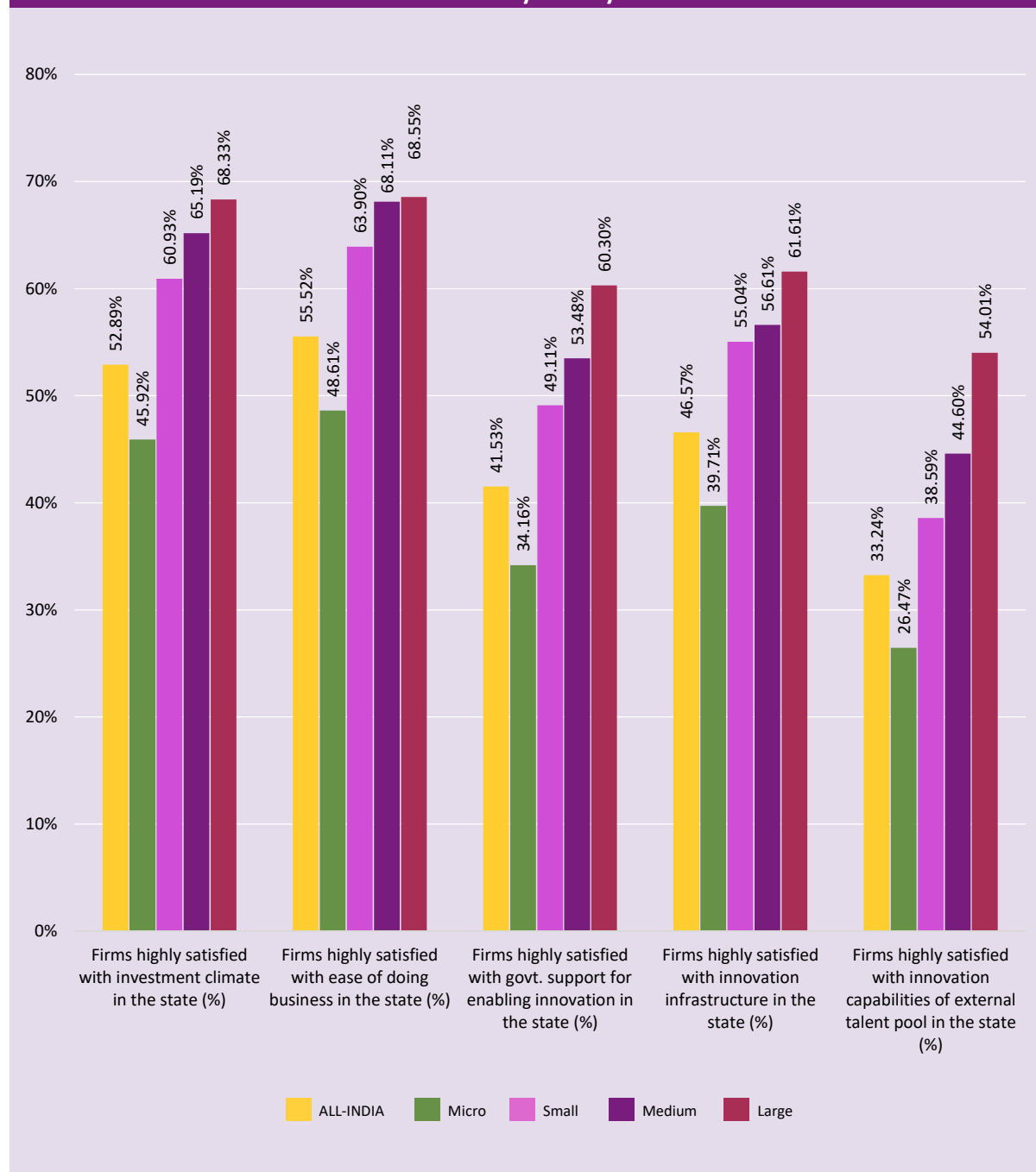
Below national average - standard deviation

5.3.3. INNOVATION ECOSYSTEM FOR FIRMS: SIZE-WISE

The Figure 5.22 presented above displays the percentage of each indicator reported across all size bins. It can be seen that 68.33% of firms in the large size bin reported being highly satisfied with the investment climate in the state, while 65.19% and 60.93% of firms in the medium and

small size bins, respectively, reported the same. In contrast, only 44.92% of firms in the micro size bin reported being highly satisfied with the investment climate. Similarly, for ease of doing business, 68.55% of firms in the large size bin reported being highly satisfied, while the corresponding percentage for the medium, small, and micro size bins was 68.11%, 63.90%, and 48.61%, respectively.

FIGURE 5.22: Satisfaction of the innovation ecosystem by firm size



When it comes to government support for enabling innovation, 60.30% of firms in the large size bin reported being highly satisfied, while only 34.16% of firms in the micro size bin reported the same. The percentage of firms highly satisfied with innovation infrastructure was highest in the large size bin at 61.61%, followed by 56.61% and 55.04% in the medium and small size bins, respectively, and 39.71% in the micro size bin. Lastly, 54.01% of firms in the large size bin reported being highly satisfied with the innovation capabilities of the external talent pool, while only 26.47% of firms in the micro size bin reported the same.

Large-sized firms have a higher level of satisfaction with the investment climate, ease of doing business, government support for enabling innovation, innovation infrastructure, and innovation capabilities of external talent pool in the state compared to medium, small, and micro-sized firms. Micro-sized firms have the lowest level of satisfaction with all the indicators compared to other size bins. There is a gradual decline in the level of satisfaction with all the indicators as we move from large-sized firms to micro-sized firms. The percentage

difference between large-sized firms and micro-sized firms is the highest for government support for enabling innovation and innovation capabilities of the external talent pool.

5.3.4. INNOVATION LINKAGES & KNOWLEDGE FLOWS: STATE-WISE

Innovation Linkages & Knowledge Flows Pillar consists of 10 indicators as shown in above graph: Share of firms with formal cooperation agreements, share of firms with informal cooperation agreements, share of firms engaging experts in advanced digital tools from external sources, share of firms exporting to international markets, share of firms importing from international markets, share of firms that collaborated with other parties on innovation activities within India, Share of firms that collaborated with other parties on innovation activities from abroad, Share of firms making use of external information sources for innovation, Share of firms with external sources of financing, Share of firms with external funding available for training. The below graph depicts the % of state with highest & lowest share of firms for each indicator.

FIGURE 5.23: Innovation linkages & knowledge flows: states with the highest & least share of firms


The Figure 5.23 provides an overview of the all-India share and the states with the highest and least share of firms reporting indicators related to innovation linkages and knowledge flows, and Table 5.7, provides a categorization of various states into three categories, based on the share of firms reporting indicators under the innovation linkages and knowledge flows pillar.

Innovation linkages and knowledge flows: the best and low performers across states

The table's best performer category includes states with a higher share of firms reporting under a particular indicator than the all-India share plus the standard deviation of that indicator. In contrast, the low performer category includes states with a share of firms reporting under an indicator lower than the all-India share minus the standard deviation of that indicator. The average performer category represents states with the share of firms reporting under a specific indicator falling within the all-India share plus standard deviation and the all-India share minus the standard deviation.

The states of Gujarat, Dadra & Nagar Haveli and Daman & Diu and Telangana, stand out as having the highest share of firms across most of the indicators. Furthermore, among all the indicators firms that collaborated with other parties on innovation activities within India had the highest number of best performing states (5).



Formal cooperation agreements: best and low performers among states

According to data from figure 5.23 and table 5.7, the national average reported for firms with formal cooperation agreements is 3.78%. However, the states with the highest share of firms are Dadra & Nagar Haveli and Daman & Diu (8.57%), followed by Karnataka (8.36%), Maharashtra (7.39%), and Haryana (6.45%). In contrast, states with the lowest share of firms are North-Eastern states (excluding Assam) (0.00%), followed by Odisha (1.28%), Punjab (1.31%) and Bihar (1.50%).



Informal cooperation agreements: best and low performers among states

Similarly, the national average reported for firms with informal cooperation agreements is 5.14%, while the states with the highest share of firms are Telangana (7.93%), followed by Karnataka (8.36%), Gujarat (7.18%), and Odisha (7.03%). On the other hand, states with the lowest share of firms are Andhra Pradesh (1.79%), followed by Bihar (1.80%), Puducherry (2.33%), and Chhattisgarh (3.11%).



Firms engaging experts in advanced digital tools from external sources: best and low performers among states

Moving on to firms engaging experts in advanced digital tools from external sources, the national average reported is 7.51%. The states with the highest share of firms in this category are Maharashtra (13.39%), Telangana (11.90%), Dadra & Nagar Haveli and Daman & Diu (12.38%), and Goa (12.00%). In contrast, states with the lowest share of firms are Andhra Pradesh (1.54%), followed by Odisha (1.60%), Bihar (3.29%), Assam (3.65%), North-Eastern states (excluding Assam) (3.82%), and Jammu & Kashmir (3.80%).



Exporting to international markets: best and low performers among states

For firms exporting to international markets, the national average reported is 21.96%. The states with the highest share of firms are Tamil Nadu (37.07%), followed by Gujarat (30.69%), and Uttar Pradesh (30.23%). However, states with the lowest share of firms are Bihar (6.59%), followed by Jharkhand (6.85%), Odisha (7.35%), North-Eastern states (excluding Assam) (9.92%), and Assam (11.87%).



Importing from international markets: best and low performers among states

For firms importing from international markets, the national average reported is 9.03%. The states with the highest share of firms are Tamil Nadu (17.24%), followed by Telangana (15.86%), New Delhi (14.97%), Uttarakhand (13.62%), and Karnataka (13.73%). In contrast, states with the lowest share of firms are Bihar (1.50%), followed by Jharkhand (1.25%), Odisha (1.92%), North-Eastern states (excluding Assam) (3.05%) and Assam (4.75%).



Domestic collaboration on innovation activities: best and low performers among states

Furthermore, the national average reported for firms that collaborated with other parties on innovation activities within India is 14.02%. The states with the highest share of firms are Karnataka (20.90%), followed by Gujarat (19.55%), Maharashtra (20.32%), Chandigarh (18.92%), and Goa (19.43%). However, states with the lowest share of firms are Bihar (4.19%), followed by Andhra Pradesh (6.15%), Jharkhand (9.35%), Uttar Pradesh (9.32%), Jammu & Kashmir (9.24%), and Puducherry (8.72%).



Foreign collaboration on innovation activities: best and low performers among states

The national average reported for firms that collaborated with other parties on innovation activities from abroad is 3.74%. The states with the highest share of firms are Haryana (6.74%), followed by Goa (6.86%), Maharashtra (5.77%), Himachal Pradesh (6.19%). However, states with the lowest share of firms are Bihar (0%), followed by Chhattisgarh (0.62%), Jharkhand (1.25%), Andhra

Pradesh (1.28%), Odisha (1.28%), and North-Eastern states (excluding Assam) (1.53%).



External information sources for innovation: best and low performers among states

The national average for firms utilizing external information sources for innovation is 33.25%. However, certain states stand out in terms of their usage of external information sources for innovation. Telangana (50.42%) leads the pack, followed by Dadra & Nagar Haveli and Daman & Diu (49.76%) and Karnataka (44.48%). Conversely, states such as Odisha (22.68%), North-Eastern states (excluding Assam) (23.66%), Andhra Pradesh (24.62%), and Bihar (26.05%) reported the lowest usage of external information sources for innovation.



External sources of financing: best and low performers among states

Similarly, the national average reported for firms with external sources of financing is 6.60%. Telangana (15.86%) and Andhra Pradesh (15.38%) have the highest share of firms utilizing external sources of financing, while Jammu & Kashmir (2.17%), Jharkhand (2.80%), and Odisha (2.56%) reported the lowest share of firms.



External funding available for training: best and low performers among states

Finally, the national average reported for firms with external funding available for training is 2.50%. Andhra Pradesh (5.38%), Bihar (3.89%), Telangana (4.25%), are the states with the highest share of firms with external funding available for training. In contrast, states such as Chandigarh (0%), Odisha (0.64%), Punjab (0.98%), West Bengal (0.87%), Dadra & Nagar Haveli and Daman & Diu (0.71%) reported the lowest usage of external funding available for training.

TABLE 5.7: Innovation linkages & knowledge flows: states with the best, average & lowest share of firm

States	Firms with formal cooperation agreements	Firms with informal cooperation agreements	Firms engaging experts in advanced digital tools from external sources	Firms exporting	Firms importing	Firms with domestic collaboration on innovation activities	Firms with foreign collaboration on innovation activities	Firms using external information sources for innovation	Firms with external sources of financing	Firms with external funding for training
All-India	3.78%	5.14%	7.51%	21.96%	9.03%	14.02%	3.74%	33.25%	6.60%	2.50%
MAJOR STATES										
Andhra Pradesh	1.79%	1.79%	1.54%	15.38%	7.18%	6.15%	1.28%	24.62%	15.38%	5.38%
Bihar	1.50%	1.80%	3.29%	6.59%	1.50%	4.19%	0.00%	26.05%	5.09%	3.89%
Chhattisgarh	2.80%	3.11%	7.14%	15.84%	6.52%	9.94%	0.62%	28.88%	4.35%	3.73%
Gujarat	4.21%	7.18%	10.40%	30.69%	8.66%	19.55%	5.45%	39.36%	4.21%	2.48%
Haryana	6.45%	5.87%	10.85%	29.91%	13.20%	17.89%	6.74%	31.96%	7.33%	3.52%
Jharkhand	2.49%	3.74%	4.36%	6.85%	1.25%	9.35%	1.25%	31.46%	2.80%	1.25%
Karnataka	8.36%	8.36%	10.75%	27.46%	13.73%	20.90%	5.67%	44.48%	8.66%	3.28%
Kerala	2.95%	5.90%	5.54%	25.46%	7.01%	13.65%	2.95%	35.06%	5.54%	2.58%
Madhya Pradesh	3.26%	5.64%	6.23%	18.40%	6.23%	16.62%	5.34%	31.45%	4.75%	3.56%
Maharashtra	7.39%	5.54%	13.39%	28.41%	11.78%	20.32%	5.77%	37.41%	6.93%	3.00%
Odisha	1.28%	7.03%	1.60%	7.35%	1.92%	11.50%	1.28%	22.68%	2.56%	0.64%
Punjab	1.31%	4.26%	4.59%	19.02%	7.87%	13.77%	2.30%	29.18%	4.59%	0.98%
Rajasthan	2.08%	5.71%	5.45%	20.52%	5.97%	12.99%	3.38%	30.39%	5.71%	2.34%
Tamil Nadu	4.60%	4.89%	10.06%	37.07%	17.24%	14.66%	5.17%	33.33%	6.90%	2.30%
Telangana	3.97%	7.93%	11.90%	30.03%	15.86%	16.71%	5.67%	50.42%	15.86%	4.25%
Uttar Pradesh	2.26%	3.67%	5.08%	30.23%	8.47%	9.32%	3.67%	29.66%	6.21%	1.98%
West Bengal	1.75%	5.25%	5.54%	18.95%	6.71%	13.99%	2.92%	27.11%	3.50%	0.87%
HILL STATES										
Assam	1.83%	6.39%	3.65%	11.87%	4.57%	14.61%	2.28%	35.62%	9.13%	3.65%
Himachal Pradesh	4.42%	4.87%	6.19%	25.66%	10.62%	15.49%	6.19%	28.32%	4.42%	1.77%
North-Eastern States (Exc. Assam)	0.00%	4.58%	3.82%	9.92%	3.05%	11.45%	1.53%	23.66%	9.16%	1.53%
Uttarakhand	4.69%	5.63%	10.33%	23.94%	13.62%	12.68%	4.23%	33.80%	6.57%	1.41%
UT & CITY STATES										
Chandigarh	5.41%	5.41%	10.81%	23.42%	10.81%	18.92%	2.70%	28.83%	6.31%	0.00%
Dadra & Nagar Haveli & Daman & Diu	8.57%	4.29%	12.38%	25.71%	11.43%	17.14%	5.71%	49.76%	7.14%	0.71%
Goa	4.00%	6.29%	12.00%	25.71%	13.14%	19.43%	6.86%	36.57%	6.86%	2.86%
Jammu & Kashmir	1.63%	3.80%	3.80%	14.67%	8.15%	9.24%	2.17%	27.17%	2.17%	1.63%
New Delhi	4.79%	6.59%	9.88%	25.15%	14.97%	16.17%	4.19%	33.83%	7.19%	2.69%
Puducherry	3.49%	2.33%	8.72%	23.84%	9.88%	8.72%	2.33%	26.74%	5.81%	1.74%
All-India % Plus Standard Deviation	5.98%	6.84%	11.07%	30.12%	13.45%	18.42%	5.76%	40.35%	9.82%	3.78%
All-India % Minus Standard Deviation	1.58%	3.44%	3.95%	13.80%	4.61%	9.62%	1.72%	26.15%	3.38%	1.22%

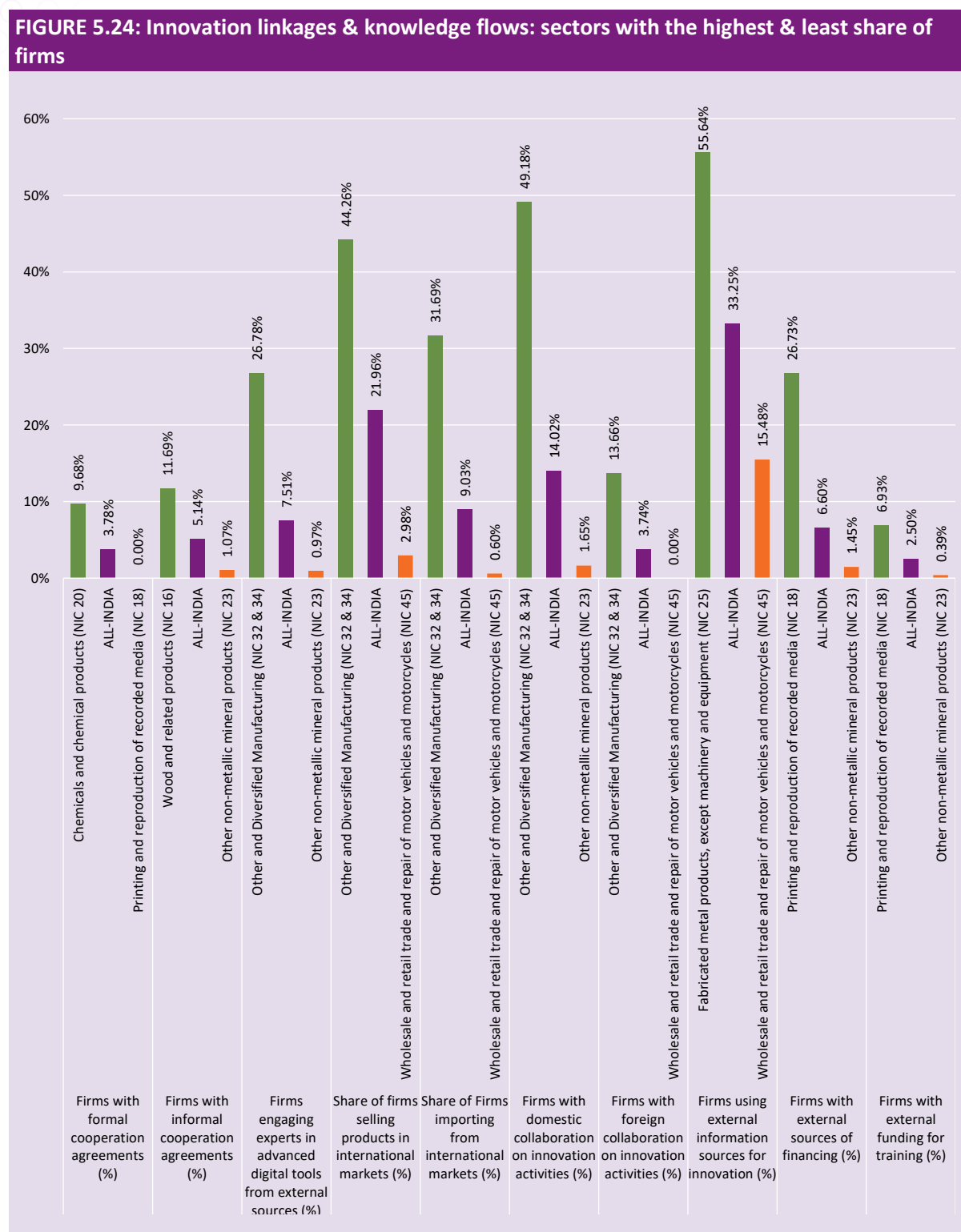
Best Performers
Above national average + standard deviation

Average Performers
Between national average + standard deviation and national average - standard deviation

Low Performers
Below national average - standard deviation

5.3.5. INNOVATION LINKAGES & KNOWLEDGE FLOWS: SECTOR-WISE

The Figure 5.24 provides an overview of the all-India share and the sectors with the highest and least share of firms reporting indicators related to innovation linkages and knowledge flows, and Table 5.8, provides a categorization of various sectors into three categories, based on the share of firms reporting indicators under the innovation linkages and knowledge flows pillar.



Innovation linkages and knowledge flows: the best and low performers across sectors

The sectors like other and diversified manufacturing, machinery and equipment, and computer, electronic and electrical equipment stand out as having the highest share of firms across most of the indicators. Furthermore, among all the indicators firms engaging experts in advanced digital tools from external sources, and firms making use of external information sources for innovation had the highest number of best performing sectors (5).



Formal cooperation agreements: best and low performers among sectors

When it comes to firms with formal cooperation agreements, the sectors with the highest share of firms are chemicals and chemical products at 9.68%, followed by other and diversified manufacturing at 8.74%, and machinery and equipment at 6.98% and computer, electronic and electrical Equipment at 6.72%. In contrast, the sectors with the lowest share of firms in this category are printing and reproduction of recorded media at 0%, followed by other non-metallic mineral products at 0.68%.



Informal cooperation agreements: best and low performers among sectors

For firms with informal cooperation agreements, the sectors with the highest share of firms are wood and related products at 11.69%, followed by textiles and apparel at 9.61% and paper and related products at 9.72% and pharmaceuticals,

medicinal chemical and botanical products at 8.88%. On the other hand, the sectors with the lowest share of firms in this category are other non-metallic mineral products at 1.07%, followed by printing and reproduction of recorded media at 1.98% and motor vehicles, trailers, and semi-trailers at 1.79%.



Exporting to international markets: best and low performers among sectors

In terms of firms exporting to international markets, other and diversified manufacturing has the highest share of firms at 44.26%, followed by computer, electronic, and electrical equipment at 36.41%, machinery and equipment at 34.88% and pharmaceuticals, medicinal chemical and botanical products at 34.75%. Meanwhile, wholesale and retail trade and repair of motor vehicles and motorcycles has the lowest share of firms in this category at 2.98%, followed by other non-metallic mineral products at 6.78% and wood and related products at 7.79%.



Importing from international markets: best and low performers among sectors

For firms importing from international markets, other and diversified manufacturing has the highest share of firms at 31.69%, followed by machinery and equipment at 18.94%. On the other hand, wholesale and retail trade and repair of motor vehicles and motorcycles at 0.60% followed by other non-metallic mineral products has the lowest share of firms in this category at 1.16%.



Firms engaging experts in advanced digital tools from external sources: best and low performers among sectors

When it comes to firms engaging experts in advanced digital tools from external sources, other and diversified manufacturing has the highest share of firms at 26.78%, followed by machinery and equipment at 20.27%, chemicals and chemical products at 17.28%, wholesale trade, except of motor vehicles and motorcycles at 16.38% and fabricated metal products, except machinery and equipment at 16.31%.



Domestic collaboration on innovation activities: best and low performers among sectors

For firms that collaborated with other parties on innovation activities within India, other and diversified manufacturing has the highest share of firms at 49.18%, followed by fabricated metal products, except machinery and equipment at 36.45%, and computer, electronic, and electrical equipment at 33.05%.



Foreign collaboration on innovation activities: best and low performers among sectors

Firms that collaborated with other parties on innovation activities from abroad were concentrated in certain sectors. The highest share of firms was found in the other and diversified manufacturing sector, with a rate of 13.66%, followed by computer, electronic and electrical Equipment with 12.32%. On the other hand, the lowest share of firms were in wholesale and retail trade and repair of motor vehicles and motorcycles (NIC 45) also with 0.00%.



External information sources for innovation: best and low performers among sectors

Moreover, the sectors with the highest share of firms making use of external information sources for innovation were fabricated metal products, except machinery and equipment with an impressive rate of 55.64%, followed by other and diversified manufacturing with 55.19%, rubber and plastics products with 53.43%, chemicals and chemical products with 49.77%, and machinery and equipment with 48.17%. Conversely, the sectors with the lowest share of firms in this area were wholesale and retail trade and repair of motor vehicles and motorcycles with 15.48%, basic metals with 18.49%.



External sources of financing: best and low performers among sectors

Furthermore, sectors with the highest share of firms with external sources of financing were in the printing and reproduction of recorded media sector, which had a rate of 26.73%. However, other sectors did not show a significant share of firms with external sources of financing.



External funding available for training: best and low performers among sectors

Lastly, the sectors with the highest share of firms with external funding available for training were in printing and reproduction of recorded media sector, with a rate of 6.93%, followed by food and beverages with 5.73%. Conversely, the sectors with the lowest share of firms in this category were other non-metallic mineral products with 0.39%, wholesale and retail trade and repair of motor vehicles and motorcycles with 0.60%, machinery and equipment with 0.66% and paper and related products with 0.69%.

TABLE 5.8: Innovation linkages & knowledge flows: sectors with the best, average & lowest share of firms

Sectors	Firms with formal cooperation agreements	Firms with informal cooperation agreements	Firms engaging experts in advanced digital tools from external sources	Firms exporting	Firms importing	Firms with domestic collaboration on innovation activities	Firms with foreign collaboration on innovation activities	Firms using external information sources for innovation	Firms with external sources of financing	Firms with external funding for training
All-India	3.78%	5.14%	7.51%	21.96%	9.03%	14.02%	3.74%	33.25%	6.60%	2.50%
Food and Beverages (NIC 10 & 11)	2.00%	3.60%	19.64%	5.06%	2.00%	8.46%	2.06%	25.03%	10.45%	5.73%
Textiles and Apparels (NIC 13 & 14)	2.99%	9.61%	32.91%	6.61%	4.72%	20.31%	2.68%	29.76%	5.83%	1.42%
Wood and related products (NIC 16)	3.25%	11.69%	7.79%	5.19%	8.44%	12.34%	2.60%	40.26%	4.55%	1.95%
Paper and related products (NIC 17)	5.21%	9.72%	14.24%	11.11%	7.29%	15.28%	4.86%	38.54%	5.90%	0.69%
Printing and reproduction of recorded media (NIC 18)	0.00%	1.98%	25.74%	12.87%	2.97%	9.90%	2.97%	33.66%	26.73%	6.93%
Chemicals and chemical products (NIC 20)	9.68%	6.68%	30.18%	17.97%	17.28%	17.97%	7.14%	49.77%	7.83%	2.07%
Pharmaceuticals, medicinal chemical and botanical products (NIC 21)	4.25%	8.88%	34.75%	10.04%	4.25%	12.36%	3.86%	25.10%	4.25%	2.70%
Rubber and plastics products (NIC 22)	5.69%	4.23%	25.99%	11.82%	14.31%	13.43%	4.67%	53.43%	6.86%	1.61%
Other non-metallic mineral products (NIC 23)	0.68%	1.07%	6.78%	1.16%	0.97%	1.65%	0.48%	19.86%	1.45%	0.39%
Basic metals (NIC 24)	3.42%	5.25%	18.49%	7.99%	4.34%	7.53%	2.28%	18.49%	4.57%	2.74%
Fabricated metal products, except machinery and equipment (NIC 25)	1.20%	4.08%	27.58%	11.51%	16.31%	36.45%	4.08%	55.64%	4.56%	1.44%
Computer, Electronic and Electrical Equipment (NIC 26 & 27)	6.72%	5.32%	36.41%	18.21%	5.60%	33.05%	12.32%	42.58%	10.64%	3.08%
Machinery and equipment (NIC 28)	6.98%	6.31%	34.88%	18.94%	20.27%	8.97%	5.32%	48.17%	5.98%	0.66%
Motor vehicles, trailers and semi-trailers (NIC 29)	2.98%	1.79%	18.45%	11.31%	11.31%	10.71%	3.57%	22.62%	5.36%	1.79%
Other and Diversified Manufacturing (NIC 32 & 34)	8.74%	6.56%	44.26%	31.69%	26.78%	49.18%	13.66%	55.19%	12.02%	2.19%
Wholesale and retail trade and repair of motor vehicles and motorcycles (NIC 45)	2.98%	3.57%	2.98%	0.60%	2.38%	4.76%	0.00%	15.48%	1.79%	0.60%
Wholesale trade, except of motor vehicles and motorcycles (NIC 46)	4.74%	3.88%	18.10%	8.19%	16.38%	11.64%	2.59%	28.02%	2.16%	0.86%
All-India % Plus Standard Deviation	6.50%	8.17%	33.53%	16.56%	15.07%	26.42%	7.40%	46.88%	12.48%	4.27%
All-India % Minus Standard Deviation	1.06%	2.11%	10.39%	1.50%	-0.05%	1.62%	0.08%	19.62%	0.72%	0.73%

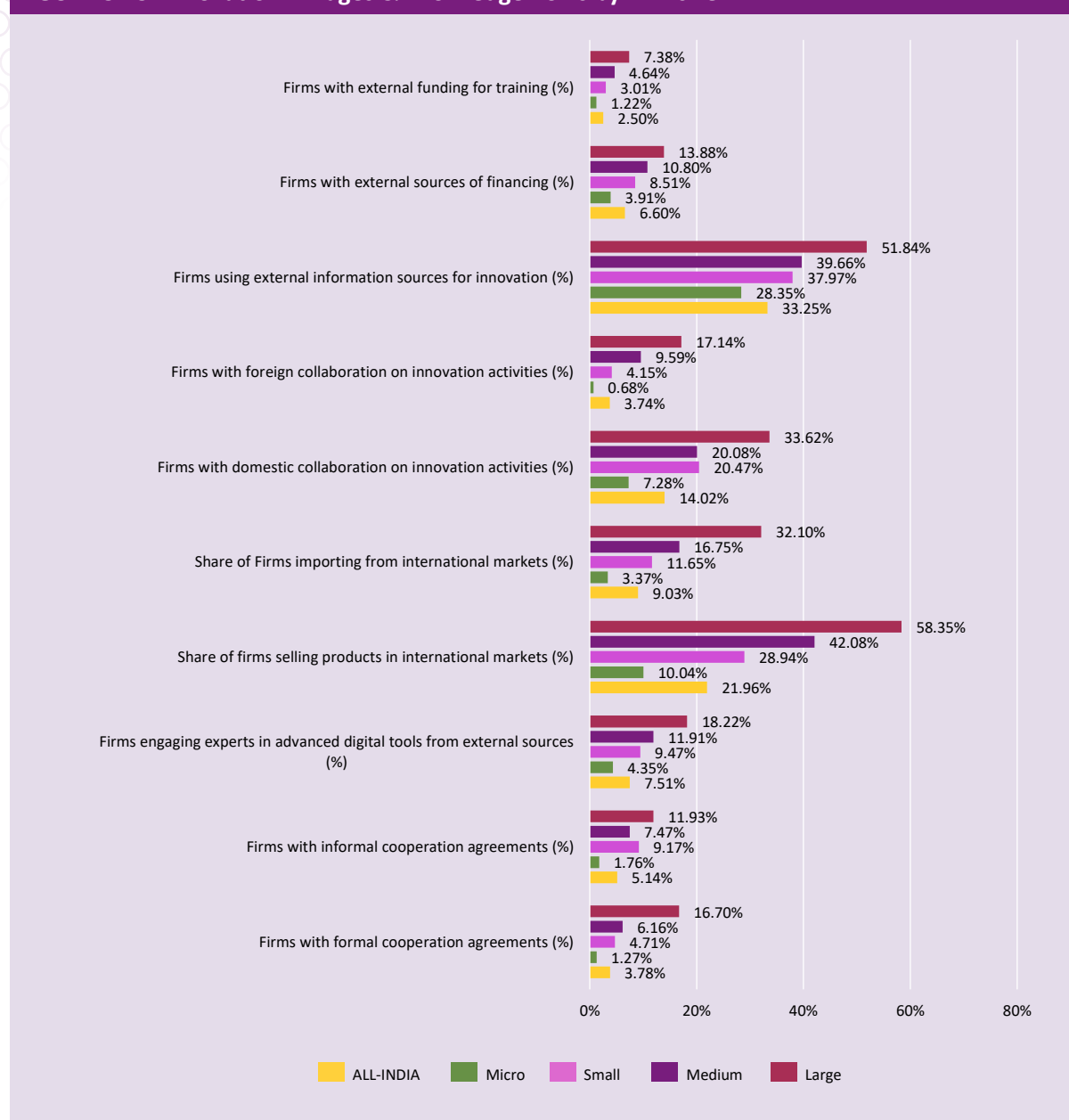
Best Performers
Above national average + standard deviation

Average Performers
Between national average + standard deviation and national average - standard deviation

Low Performers
Below national average - standard deviation

5.3.6. INNOVATION LINKAGES & KNOWLEDGE FLOWS: SIZE-WISE

FIGURE 5.25: Innovation linkages & knowledge flows by firm size



The graph presented above provides insights into the percentage of various indicators reported across different size bins. The analysis indicates that the share of firms with formal cooperation agreements is higher among large-sized firms, with 16.70% of large firms reporting such agreements, as compared to only 6.16% of medium-sized firms and 4.71% of small-sized

firms. The percentage further drops to 1.27% for micro-sized firms. Similarly, for informal cooperation agreements, 11.93% of large-sized firms reported such agreements, while 7.47% of medium-sized firms, 9.17% of small-sized firms, and 1.76% of micro-sized firms reported the same.

In terms of firms engaging experts in advanced digital tools from external sources, 18.22% of large-sized firms reported such engagements, while 11.91% of medium-sized firms, 9.47% of small-sized firms, and 4.35% of micro-sized firms reported the same. The analysis also highlights that large-sized firms had the highest share of firms exporting to international markets, with 58.35% of large firms reporting such exports, as compared to only 42.08% of medium-sized firms, 28.94% of small-sized firms, and 10.04% of micro-sized firms. Similarly, for firms importing from international markets, 32.10% of large-sized firms reported such imports, while only 16.75% of medium-sized firms, 11.65% of small-sized firms, and 3.37% of micro-sized firms reported the same. Collaboration on innovation activities with other parties within India was more common among large-sized firms, with 33.62% of large firms reporting such collaborations, as compared to 20.08% of medium-sized firms, 20.47% of small-sized firms, and 7.28% of micro-sized firms.

In terms of collaborating with other parties on innovation activities from abroad, the analysis indicates that only 17.14% of large-sized firms reported such collaborations, while 9.59% of medium-sized firms, 4.15% of small-sized firms, and 0.68% of micro-sized firms reported the

same. Furthermore, the share of firms making use of external information sources for innovation was higher among large-sized firms, with 51.84% of large firms reporting such usage, as compared to 39.66% of medium-sized firms, 37.97% of small-sized firms, and 28.35% of micro-sized firms. In terms of firms with external sources of financing, 13.88% of large-sized firms reported having such sources, while only 10.80% of medium-sized firms, 8.51% of small-sized firms, and 3.91% of micro-sized firms reported the same. Lastly, only 7.38% of large-sized firms reported having external funding available for training, while 4.64% of medium-sized firms, 3.01% of small-sized firms, and 1.22% of micro-sized firms reported the same.

The analysis reveals that large-sized firms reported the highest percentage for most of the indicators, including formal cooperation agreements, engaging experts in advanced digital tools, exporting to international markets, collaborating with other parties on innovation activities within India and making use of external information sources for innovation. Meanwhile, micro-sized firms reported the lowest percentage for most of the indicators, indicating the need for more support and resources to enhance their performance.



6

INNOVATION BARRIERS

INNOVATION BARRIERS

6

Barriers refer to the obstacles that firms encounter during their innovation process, impeding their ability to transform innovation enablers into performance. In the manufacturing and related services sector in India, the "Barrier" dimension of innovation encompasses four key pillars: Potential and capability barriers, financial barriers, policy barriers, and market and linkage barriers.

Potential and capability barriers stem from internal limitations of firms, such as a dearth of skilled personnel, insufficient R&D and design capacities, organizational rigidity, and a low innovation mindset. Financial barriers include a lack of funds, high perceived risks, high innovation costs, and a dearth of external financing. Policy barriers are associated with legislation, regulations, standards, taxation, and the intellectual property regime. Market and linkage barriers pertain to issues related to market information, availability of external services, cooperation partners, technology information, market dominance, competition, and low demand for innovative goods and services.

The barriers (%) reported in this chapter indicate the presence of barriers, reflecting the proportion of firms reporting at least one barrier. Therefore, a state/sector/size with a high share of firms reporting any of the barriers would signify a high presence of that barrier, and vice versa.

This chapter presents a comprehensive evaluation of the various barriers faced by manufacturing and related services firms in India across states, sectors, and sizes of the firms. Firstly, the presence and criticality of each barrier were analyzed to understand the degree to which certain barriers impede innovation. Secondly, the presence of each barrier pillar was compared across firm sizes. Thirdly, for each barrier indicator, the states and sectors with the highest and lowest share of firms reporting that barrier were identified and compared with the national share of firms reporting the barrier. Finally, state and sector-wise comparisons were conducted to identify the states and sectors with the highest, average, and lowest share of firms that reported each barrier in comparison to the national share and standard deviation of that barrier.

The objective of this chapter is to shed light on the barriers encountered by manufacturing and related services firms in India and support informed decision-making to enhance innovation and competitiveness in the sector.

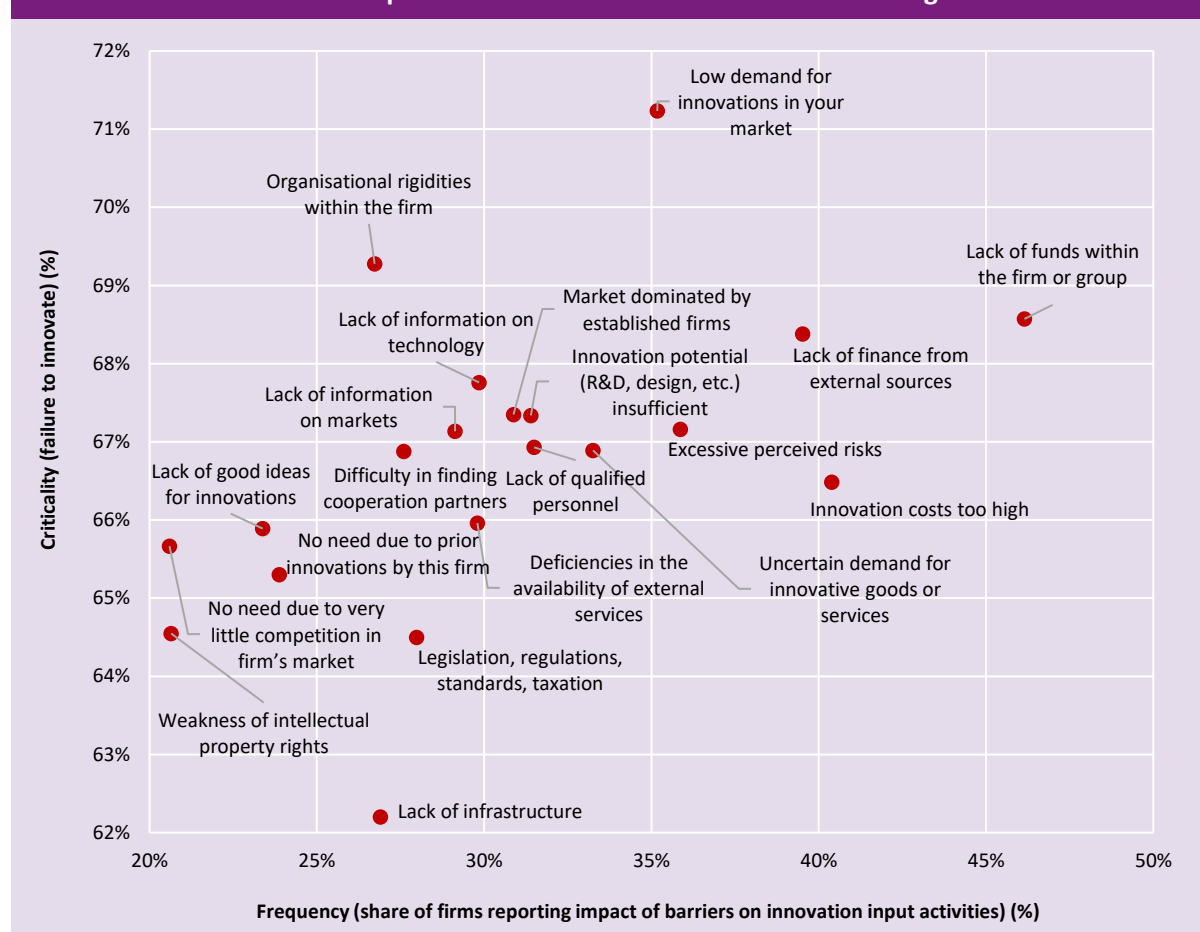
Frequency (Presence of Barriers) versus Criticality (Failure to Innovate)

Figure 6.1 presents a graphical representation of the frequency (presence) of each barrier faced by firms versus the impact of each barrier on innovation performance. The impact of a barrier on innovation performance is reflected in the proportion of firms that faced a particular

barrier and consequently failed to innovate. The frequency of a barrier indicates the proportion of firms that reported the impact of a barrier on their innovation activities. Criticality is a subset of frequency, as it represents the proportion of

non-innovative firms (firms that were not successful in introducing innovations) out of the firms that reported the presence of a particular barrier (frequency).

FIGURE 6.1: Critical versus frequent barriers to innovation in manufacturing



The results of the study indicate that lack of funds within the firm or group, unaffordable innovation costs, and lack of finance from external sources were the most frequently reported barriers to innovation, with 46.15%, 40.30%, and 39.52% of firms reporting these barriers, respectively. However, low demand for innovations in the market, organisational rigidities within the firm, lack of funds within the firm or group, and lack of finance from external

sources were the most critical barriers, reported by 71.23%, 69.28%, 68.57%, and 68.38% of firms, respectively.

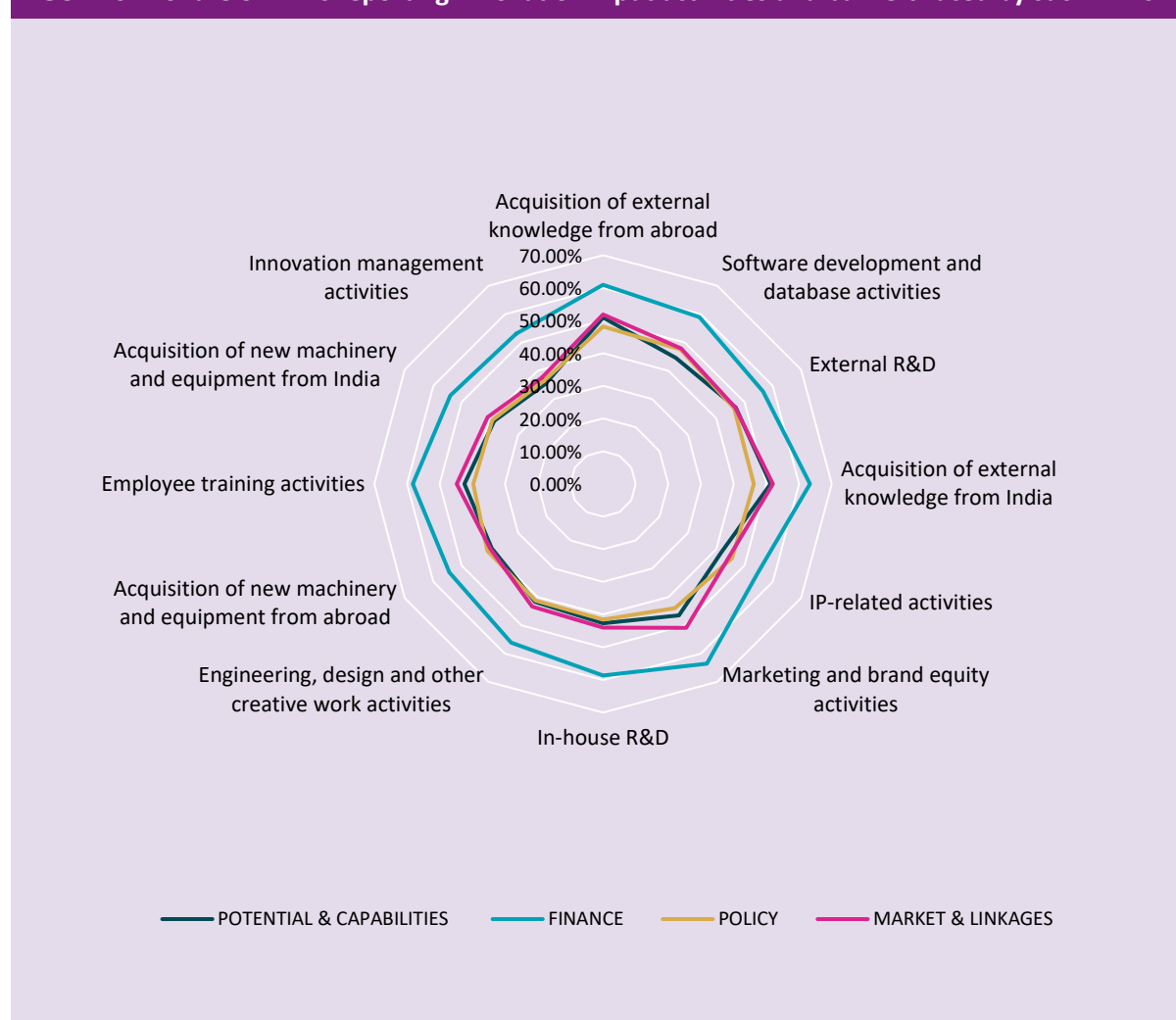
Figure 6.2 provides a breakdown of the types of barriers faced by firms while engaging in various innovation input activities discussed in Chapter 5. The findings reveal that financing was the most prevalent barrier across all innovation activities. Market and linkage barriers were the second highest reported barriers for firms

engaged in all innovation activities except external R&D, IP-related activities, and the acquisition of new machinery and equipment from abroad. For firms engaged in external R&D activities, Potential and capability barriers were the second highest reported barriers.

The study found that a higher proportion of firms engaged in marketing and brand equity activities (63.59%) and the acquisition of external knowledge from India (63.33%) or abroad (60.94%) faced financing barriers. In contrast, a higher proportion of firms engaged in the acquisition of external knowledge from India

(51.99%) or abroad (51.86%) and marketing and brand equity activities (50.89%) faced market and linkage-related barriers. Furthermore, 51.28%, 50.91%, and 46.87% of firms engaged in the acquisition of external knowledge from India or abroad and external R&D faced Potential and capability barriers, respectively. Policy-related barriers were reported by 48.18% of firms engaged in the acquisition of external knowledge from abroad, 47.52% of firms engaged in software development and database activities, and 46.31% of firms engaged in external R&D.

FIGURE 6.2: Share of firms reporting innovation input activities and barriers faced by such firms

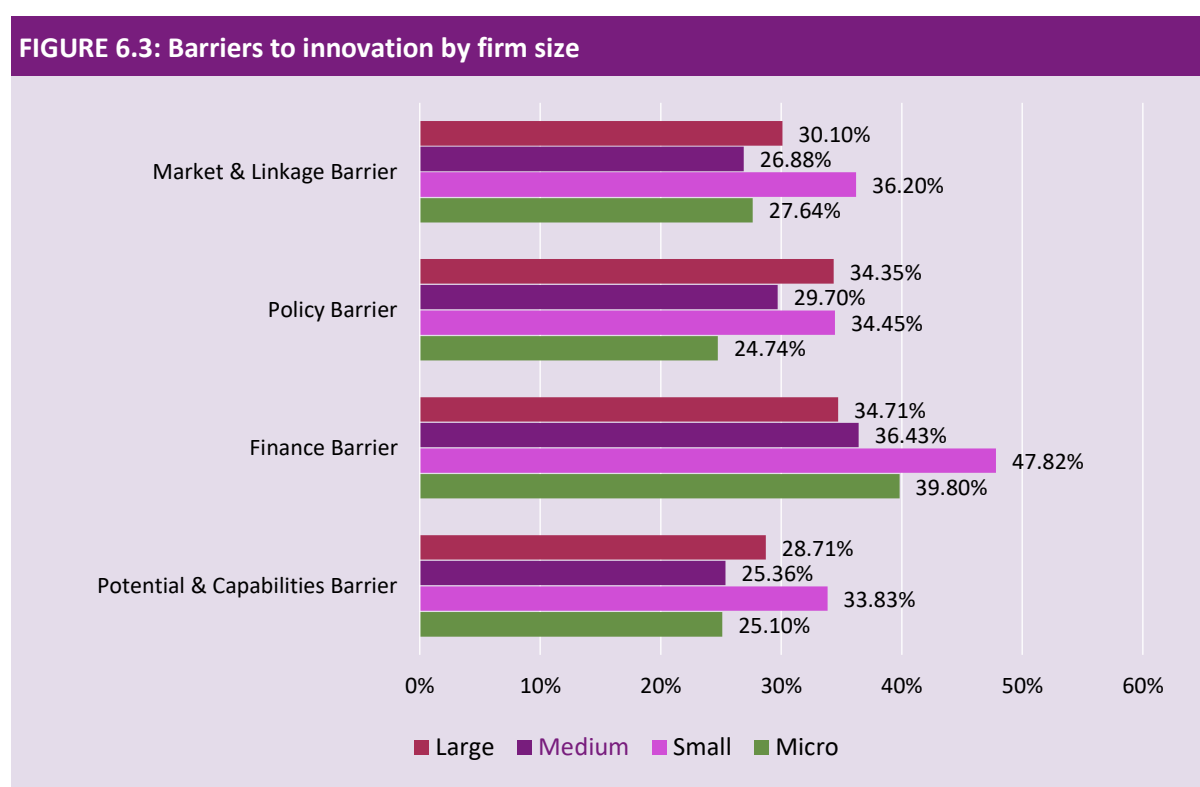


Barriers to innovation by firm size

Figure 6.3 presents the presence of barriers related to Potential and capability, financing, policy and market and linkages as reported by firms across all size groups.

The analysis reveals that financing and market and linkages are the most frequently reported

barriers across all firm sizes. It is noteworthy that small firms reported the highest percentage of barriers across all pillars, and not micro firms. The financing-related barriers were the most common category of barriers faced by MSMEs, while large firms reported policy-related barriers slightly higher than financing-related barriers, as depicted in Figure 6.3.



Interestingly, micro firms reported the lowest frequency for three out of four innovation barrier pillars. Additionally, in all pillars, a lower share of micro firms reported barriers compared to small firms. The least common barrier reported by micro firms were policy-related barriers, while the least common barrier reported by large, medium, and small firms were those related to Potential and capability. These findings provide valuable insights into the innovation landscape of MSMEs and highlight

the need for targeted interventions to overcome the prevalent barriers.

6.1. POTENTIAL & CAPABILITY BARRIERS

The category of "Potential and capability Barriers" encompasses various obstacles that can hinder a firm's internal capabilities, such as inadequate innovation potential, a lack of qualified personnel, organisational inflexibilities,

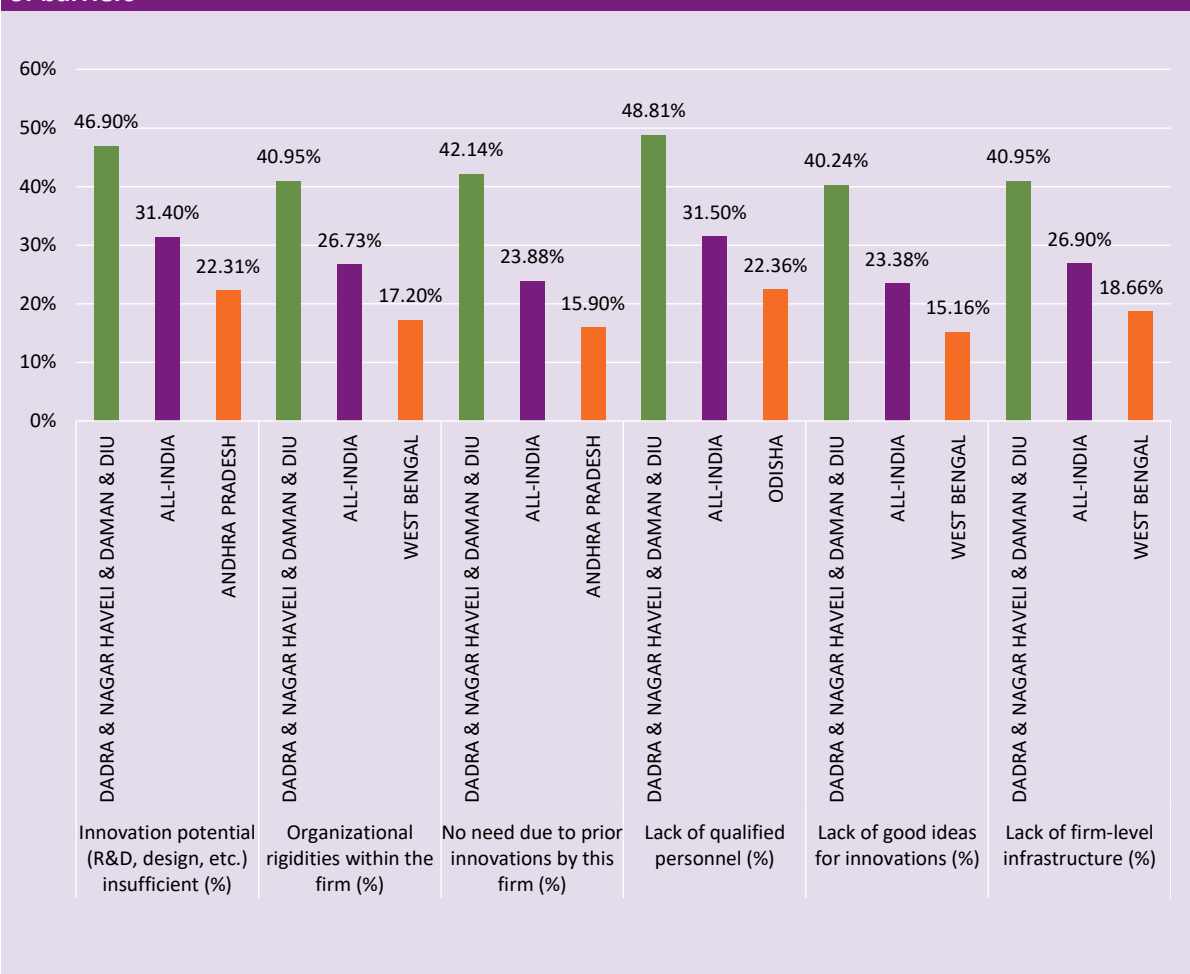
limited R&D and design capacities, inadequate firm-level infrastructure, and a dearth of an innovative mindset. As previously mentioned, the presence of barriers is calculated based on the number of firms that reported a particular barrier, with a higher share indicating a higher presence of the barrier. This pillar has six indicators, namely: 1) insufficient innovation capability (e.g. R&D design, etc.), 2) organisational rigidities, 3) lack of need for innovation due to prior innovations, 4) shortage of qualified personnel, 5) shortage of innovative ideas, and 6) limited firm-level infrastructure.

6.1.1. POTENTIAL & CAPABILITY BARRIERS FACED BY FIRMS: STATE-WISE

Figure 6.4 displays the states that have reported the highest and lowest presence of Potential and capability barriers. The firms in Dadra & Nagar Haveli and Daman & Diu exhibited the highest presence of all Potential and capability barriers across all indicators.

The results of a study on potential & capabilities barriers in India are presented in Figure 6.4 and Table 6.1. The study identifies six barriers that hinder innovation potential & capabilities in different states of India.

FIGURE 6.4: Potential & capability barriers reported by firms: states with high and low presence of barriers





Insufficient innovation capability: states with high & low presence of barriers

The first barrier is insufficient innovation capability, which is reported at a national average of 31.40%. Dadra & Nagar Haveli and Daman & Diu and Gujarat have the highest presence of this barrier, while Andhra Pradesh, Odisha, Uttar Pradesh, West Bengal, and North-eastern States (excluding Assam) have the lowest presence.



Organisational rigidities: states with high & low presence of barriers

The second barrier is organisational rigidities, which are reported at a national average of 26.73%. Dadra & Nagar Haveli and Daman & Diu, Gujarat, Kerala, and Maharashtra have the highest presence, while Andhra Pradesh, West Bengal, and North-eastern States (excluding Assam) have the lowest.



No need due to prior innovations by firm: states with high & low presence of barriers

The third barrier is the absence of a need for innovation, which is reported at a national average of 23.88%. Dadra & Nagar Haveli and Daman & Diu, Gujarat, and Maharashtra have the highest presence, while Andhra Pradesh, North-eastern States (excluding Assam), Puducherry, Bihar, and Uttar Pradesh have the lowest.



Lack of qualified personnel: states with high & low presence of barriers

The fourth barrier is lack of qualified personnel, which is reported at a national average of 31.50%. Dadra & Nagar Haveli and Daman & Diu and Gujarat have the highest presence, while Andhra Pradesh, Odisha, North-eastern States (excluding Assam), and West Bengal have the lowest.



Lack of good ideas for innovation: states with high & low presence of barriers

The fifth barrier is lack of good ideas for innovation, which is reported at a national average of 23.38%. Dadra & Nagar Haveli and Daman & Diu and Gujarat have the highest presence, while Puducherry, Rajasthan, Uttarakhand, Odisha, and West Bengal have the lowest.



Lack of firm-level infrastructure: states with high & low presence of barriers

Finally, the sixth barrier is lack of firm-level infrastructure, which is reported at a national average of 26.90%. Dadra & Nagar Haveli and Daman & Diu, Telangana, Gujarat, Goa, and Maharashtra have the highest presence, while Odisha, West Bengal, and Rajasthan have the lowest.

Dadra & Nagar Haveli and Daman & Diu are common outliers for barriers like absence of need for innovation due to prior innovations by the firm, lack of good ideas for innovation and lack of firm-level infrastructure.

FIGURE 6.5: Potential and capability barriers reported by firms: distribution of states

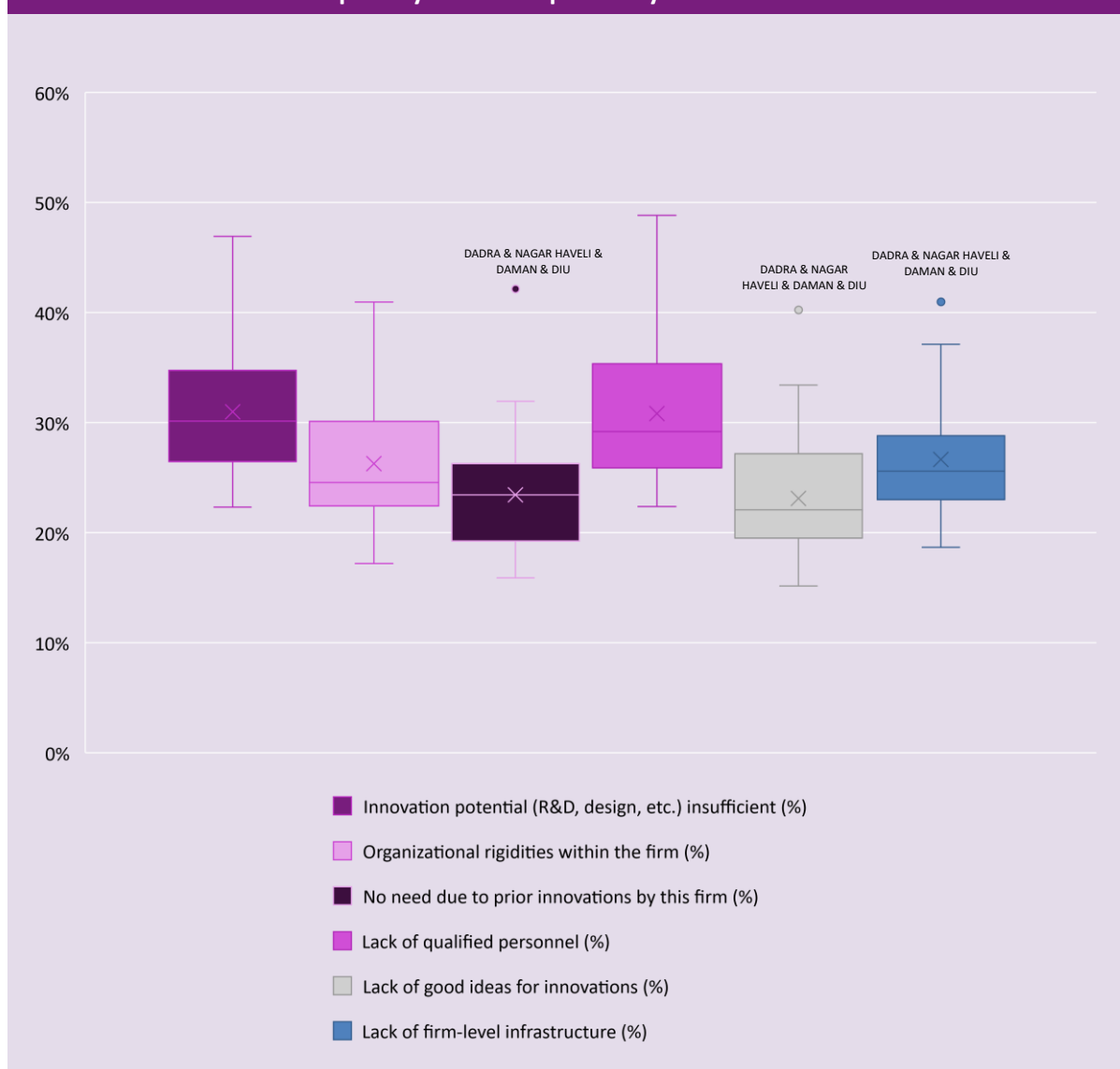


Table 6.1 provides a classification of states based on the existence of barriers, dividing them into three groups. High presence of barriers is indicated in red, while low presence of barriers is depicted in green. The states with the highest indicator values show a high presence of barriers, while states with the lowest values show a low presence of barriers. The presence of barriers is calculated as the share of firms that reported a particular barrier, with a higher share indicating a higher presence of the barrier. High presence of barriers for each indicator is defined

as states with the share of firms reporting the barrier greater than the all-India percentage plus standard deviation of that indicator. Average presence of barriers is defined as states with the share of firms reporting the barrier between the all-India percentage plus standard deviation and all-India percentage minus standard deviation for that indicator. Low presence of barriers is defined as states with the share of firms reporting the barrier less than the all-India percentage minus standard deviation.

TABLE 6.1: Potential & capability barriers reported by firms: states with high, average and low presence of barriers

States	Innovation potential (R&D, design, etc.) insufficient	Organizational rigidities within the firm	No need due to prior innovations by this firm	Lack of qualified personnel	Lack of good ideas for innovations	Lack of firm-level infrastructure
All-India	31.40%	26.73%	23.88%	31.50%	23.38%	26.90%
MAJOR STATES						
Andhra Pradesh	22.31%	17.95%	15.90%	22.56%	19.74%	21.28%
Bihar	26.35%	23.35%	17.07%	25.75%	21.26%	23.05%
Chhattisgarh	34.78%	30.43%	27.02%	37.27%	28.57%	31.68%
Gujarat	45.05%	39.60%	31.93%	47.03%	33.42%	36.39%
Haryana	29.62%	21.41%	22.58%	25.81%	17.89%	23.75%
Jharkhand	26.79%	23.36%	19.63%	29.91%	20.25%	21.50%
Karnataka	32.84%	26.57%	23.28%	31.64%	22.69%	27.16%
Kerala	33.58%	34.32%	26.20%	29.89%	23.25%	24.72%
Madhya Pradesh	29.67%	24.33%	25.52%	28.49%	22.26%	24.33%
Maharashtra	37.18%	33.03%	29.56%	38.11%	27.25%	34.41%
Odisha	22.68%	22.36%	21.73%	22.36%	16.93%	19.49%
Punjab	31.80%	22.62%	23.61%	31.48%	24.26%	27.21%
Rajasthan	28.31%	24.68%	18.70%	28.05%	17.40%	20.78%
Tamil Nadu	30.17%	24.43%	21.84%	32.76%	19.54%	22.99%
Telangana	34.56%	29.18%	24.08%	36.83%	27.76%	37.11%
Uttar Pradesh	23.45%	21.75%	17.80%	25.42%	19.49%	23.45%
West Bengal	25.07%	17.20%	19.24%	24.20%	15.16%	18.66%
HILL STATES						
Assam	27.40%	26.94%	23.29%	26.48%	21.92%	26.48%
Himachal Pradesh	30.09%	25.66%	23.89%	27.88%	19.91%	21.24%
Ner States	24.43%	19.08%	16.03%	22.90%	20.61%	25.95%
Uttarakhand	27.70%	21.60%	19.25%	27.23%	17.37%	26.29%
UT & CITY STATES						
Chandigarh	32.43%	24.32%	24.32%	27.93%	27.93%	25.23%
Dadra & Nagar Haveli & Daman & Diu	46.90%	40.95%	42.14%	48.81%	40.24%	40.95%
Goa	36.57%	30.86%	26.29%	36.00%	28.57%	35.43%
Jammu & Kashmir	34.78%	26.63%	26.63%	35.33%	25.54%	29.35%
New Delhi	35.93%	32.63%	27.84%	35.33%	26.95%	26.35%
Puducherry	25.58%	23.26%	16.86%	26.16%	17.44%	24.42%
All-India % plus standard deviation	37.63%	32.78%	29.52%	38.32%	29.09%	32.69%
All-India % minus standard deviation	25.17%	20.68%	18.24%	24.68%	17.67%	21.11%

Best Performers

Above national average + standard deviation

Average Performers

Between national average + standard deviation and national average - standard deviation

Low Performers

Below national average - standard deviation

According to Table 6.1, Dadra & Nagar Haveli and Daman & Diu, Gujarat, and to some extent Maharashtra are the states with the highest presence of barriers, while Telangana and Karnataka fall somewhere in between. Notably, a majority of the top-performing states, as determined by the IMII score, exhibit a high presence of barriers. Conversely, states with a low presence of barriers include the North-eastern region (excluding Assam), Odisha, Andhra Pradesh, and West Bengal. Additionally, it is noteworthy that Telangana, a top-performing state, faces a high presence of the lack of firm-level infrastructure barrier, and Kerala is affected by organizational rigidity. It is interesting to observe that in Bihar, a low-performing state, firms reported a low presence of the need for innovation, and Rajasthan and Uttarakhand reported low presence of the lack of good ideas for innovation.

With regard to the five barriers to innovation, states with a high presence include Dadra & Nagar Haveli and Daman & Diu, Gujarat, and Maharashtra. These states report high levels of insufficiency of innovation potential, organizational rigidities, absence of need for innovation, lack of qualified personnel, and lack of good ideas for innovations. Conversely, states with a low presence include Andhra Pradesh, Odisha, Uttar Pradesh, West Bengal, and the North-eastern States (excluding Assam). These states report low levels of the aforementioned barriers. States with an intermediate presence of

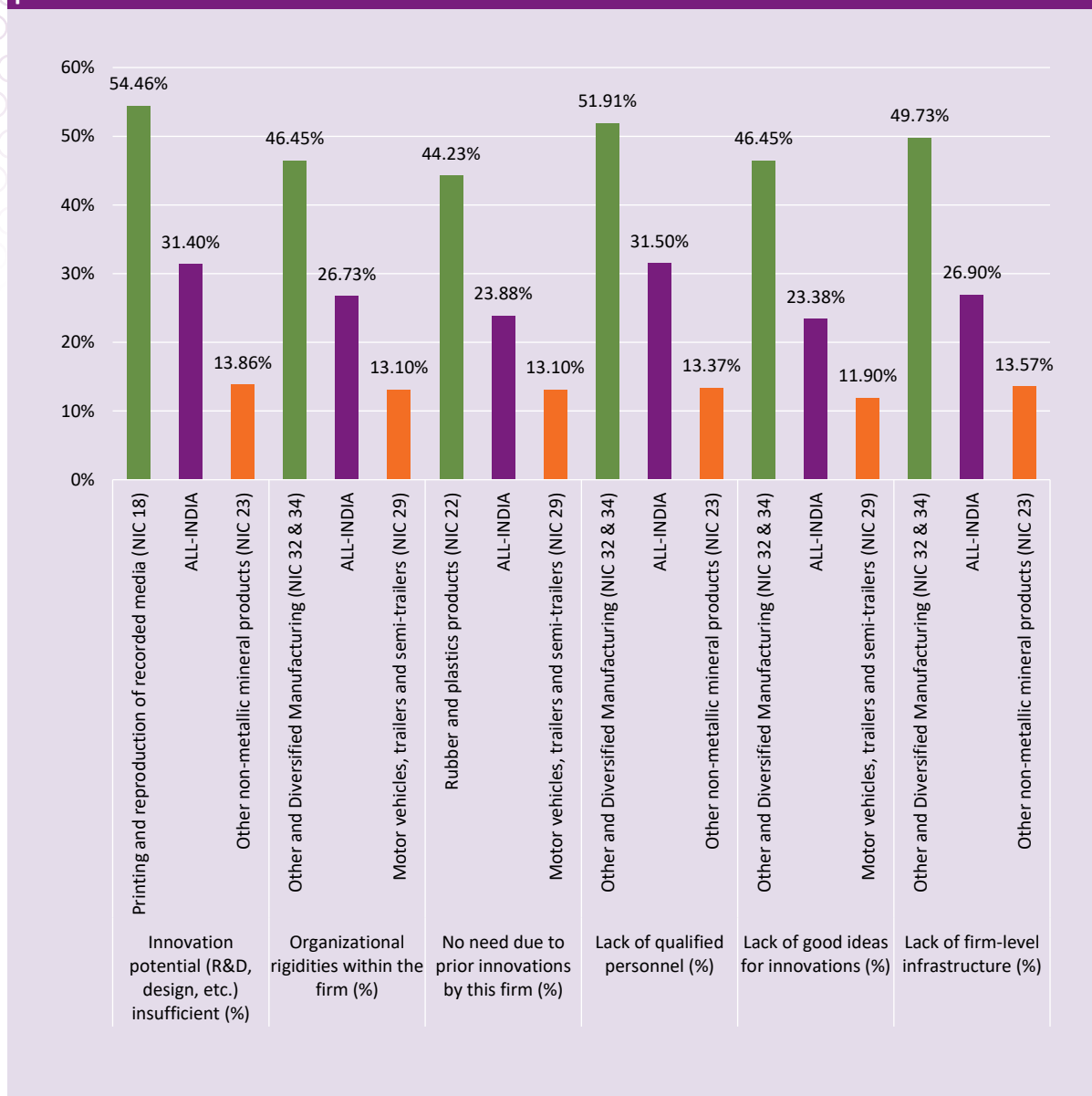
barriers include Telangana, Kerala, New Delhi, Chhattisgarh, Bihar, Puducherry, Rajasthan, and Uttarakhand.

6.1.2. POTENTIAL AND CAPABILITY BARRIERS FACED BY FIRMS: SECTOR-WISE

The data presented in Figure 6.6 showcases the sectors that have reported the highest and lowest presence of Potential and capability barriers. The other and diversified manufacturing sector has reported the highest presence of Potential and capability barriers across most indicators, along with the printing and reproduction of recorded media sector in the insufficient innovation potential indicator (54.46%) and the rubber and plastic products sector (NIC 22) in the absence of need for innovation due to prior innovations by the firm (44.23%).

The figure 6.6 and table 6.2 highlights the existence of multiple barriers that hinder the innovation potential of different sectors. One such barrier is the insufficient innovation capability, which is prevalent in several industries, including printing and reproduction of recorded media, chemicals and chemical products, and wood and related products. On the other hand, some sectors such as other non-metallic mineral products and wholesale trade except for motor vehicles and motorcycles exhibit low levels of this barrier.

FIGURE 6.6: Potential and capability barrier reported by firms: sectors with high and low presence of barriers



Organizational rigidities are also identified as a significant barrier that affects innovation potential. Sectors such as other and diversified manufacturing, rubber and plastics products, and paper and related products report high levels of this barrier. In contrast, the motor vehicles, trailers, and semi-trailers sector is the only sector with a low presence of organizational rigidity barriers.

Moreover, the report identifies an absence of the need for innovation barrier due to prior innovation by the firm. Sectors like rubber and plastics products, other and diversified manufacturing, and machinery and equipment report high levels of this barrier. Conversely, no sector reports a low presence of this barrier among the 17 sectors considered for analysis.

Additionally, lack of qualified personnel is also identified as a significant barrier to innovation potential in different industries such as other and diversified manufacturing, rubber and plastics products, and machinery and equipment. On the other hand, sectors like other non-metallic mineral products, wholesale trade except for motor vehicles and motorcycles, and pharmaceuticals, medicinal chemical and botanical products report low levels of this barrier.

Furthermore, the lack of good ideas for innovation is another significant barrier to innovation potential in several sectors such as other and diversified manufacturing, rubber and plastics products, and chemicals and chemical products. Among the 17 sectors analyzed, no sector reports a low presence of this barrier. Lastly, the report identifies the lack of firm-level infrastructure as a significant barrier to innovation potential, with sectors such as other and diversified manufacturing, rubber and plastics products, and chemicals and chemical products reporting high levels of this barrier.

Table 6.2 provides a classification of states based on the existence of barriers into three groups, with the highest indicator values denoting a high presence of barriers and depicted in red, while

the lowest indicator values indicate a low presence of barriers and are depicted in green. The states with high presence of barriers for each indicator are those with the share of firms that reported the barrier greater than the all-India percentage plus standard deviation of that indicator. States with an average presence of barriers have a share of firms that reported a particular barrier between the all-India percentage plus standard deviation and all-India percentage minus standard deviation for that indicator, while states with a low presence of barrier are those with a share of firms that reported the barrier less than the all-India percentage minus standard deviation.

According to Table 6.2, the sectors with a high presence of barriers include other and diversified manufacturing, rubber and plastic products, chemicals and chemical products, printing and reproduction of recorded media, and wood and related products. In contrast, other non-metallic mineral products and wholesale trade, except of motor vehicles and motorcycles, are identified as sectors with an overall low presence of barriers. It is noteworthy that very few sectors across all barrier indicators have low presence of barriers.

TABLE 6.2: Potential & capability barriers reported by firms: sectors with high, average and low presence of barriers

States	Innovation potential (R&D, design, etc.) insufficient	Organizational rigidities within the firm	No need due to prior innovations by this firm	Lack of qualified personnel	Lack of good ideas for innovations	Lack of firm-level infrastructure
All-India	31.40%	26.73%	23.88%	31.50%	23.38%	26.90%
Food and Beverages (NIC 10 & 11)	21.30%	18.64%	15.71%	21.57%	14.11%	17.64%
Textiles and Apparels (NIC 13 & 14)	39.06%	29.61%	22.99%	35.91%	18.11%	21.57%
Wood and related products (NIC 16)	46.10%	41.56%	21.43%	49.35%	31.82%	44.16%
Paper and related products (NIC 17)	43.75%	39.58%	30.56%	42.36%	33.68%	38.54%
Printing and reproduction of recorded media (NIC 18)	54.46%	31.68%	35.64%	48.51%	39.60%	36.63%
Chemicals and chemical products (NIC 20)	48.16%	39.86%	39.17%	48.85%	43.32%	44.93%
Pharmaceuticals, medicinal chemical and botanical products (NIC 21)	24.71%	17.37%	20.85%	20.85%	13.90%	18.92%
Rubber and plastics products (NIC 22)	48.47%	45.55%	44.23%	51.39%	45.11%	46.28%
Other non-metallic mineral products (NIC 23)	13.86%	16.76%	15.21%	13.37%	11.92%	13.57%
Basic metals (NIC 24)	23.52%	17.12%	13.24%	24.66%	14.38%	17.81%
Fabricated metal products, except machinery and equipment (NIC 25)	36.93%	34.05%	33.09%	37.89%	30.22%	34.05%
Computer, Electronic and Electrical Equipment (NIC 26 & 27)	30.25%	23.25%	26.05%	29.41%	23.53%	29.97%
Machinery and equipment (NIC 28)	44.52%	39.53%	37.87%	49.83%	35.55%	42.52%
Motor vehicles, trailers, and semi-trailers (NIC 29)	22.02%	13.10%	13.10%	23.21%	11.90%	16.07%
Other and Diversified Manufacturing (NIC 32 & 34)	50.82%	46.45%	43.17%	51.91%	46.45%	49.73%
Wholesale and retail trade and repair of motor vehicles and motorcycles (NIC 45)	23.21%	17.26%	18.45%	23.81%	16.07%	14.88%
Wholesale trade, except of motor vehicles and motorcycles (NIC 46)	17.67%	17.24%	16.38%	16.38%	18.10%	16.38%
All-India % <i>plus</i> standard deviation	44.61%	38.47%	34.67%	45.22%	35.92%	39.98%
All-India % <i>minus</i> standard deviation	18.19%	14.99%	13.09%	17.78%	10.84%	13.82%

Best Performers
Above national average + standard deviation

Average Performers
Between national average + standard deviation and national average - standard deviation

Low Performers
Below national average - standard deviation

6.1.3. POTENTIAL AND CAPABILITY BARRIERS FACED BY FIRMS: SIZE-WISE

The data presented in figure 6.7 showcases the size bins that have reported the highest and lowest levels of Potential and capability barriers. Small-size firms have reported the highest presence of Potential and capability barriers across all indicators and medium-size firms have reported a lower presence of Potential and

capability barriers across all indicators. It can be observed that the majority of the firms, irrespective of size bins, incline towards having a high presence of insufficient innovation potential and lack of qualified personal barriers. Barriers less reported are for lack of good ideas of innovations though there is hardly a difference compared to other indicators under this pillar.

FIGURE 6.7: Potential and capability barriers by firm size



The data reveals that firms of all sizes face various barriers to innovation. Insufficient innovation capability is the most common barrier, with small firms reporting the highest incidence at 38.80%, followed by large firms at 31.67%. Organisational rigidities within firms are also a significant barrier, with small firms reporting the highest incidence at 32.52%,

followed by large firms at 27.11%. This highlights the need for firms to focus on improving their innovation potential and organisational flexibility to stay competitive.

The absence of a need to innovate due to prior innovations by the firm is also a notable barrier, with small firms reporting the highest incidence at 39.68%. This suggests that firms that have

already introduced innovative products or processes may become complacent and not invest in further innovation, potentially losing their competitive advantage. The lack of qualified personnel availability is another significant barrier, with small firms reporting the highest incidence at 39.68%. This highlights the importance of investing in training and attracting skilled personnel to support innovation efforts.

Finally, the lack of good ideas for innovation and firm-level infrastructure are also significant barriers to innovation, with small firms reporting the highest incidence at 29.03% and 33.30%, respectively. This emphasizes the need for firms to foster a culture of innovation and invest in research and development, as well as the necessary infrastructure to support innovation efforts. Overall, these findings underscore the importance of addressing these barriers to ensure that firms of all sizes can remain innovative and competitive in today's dynamic business environment.

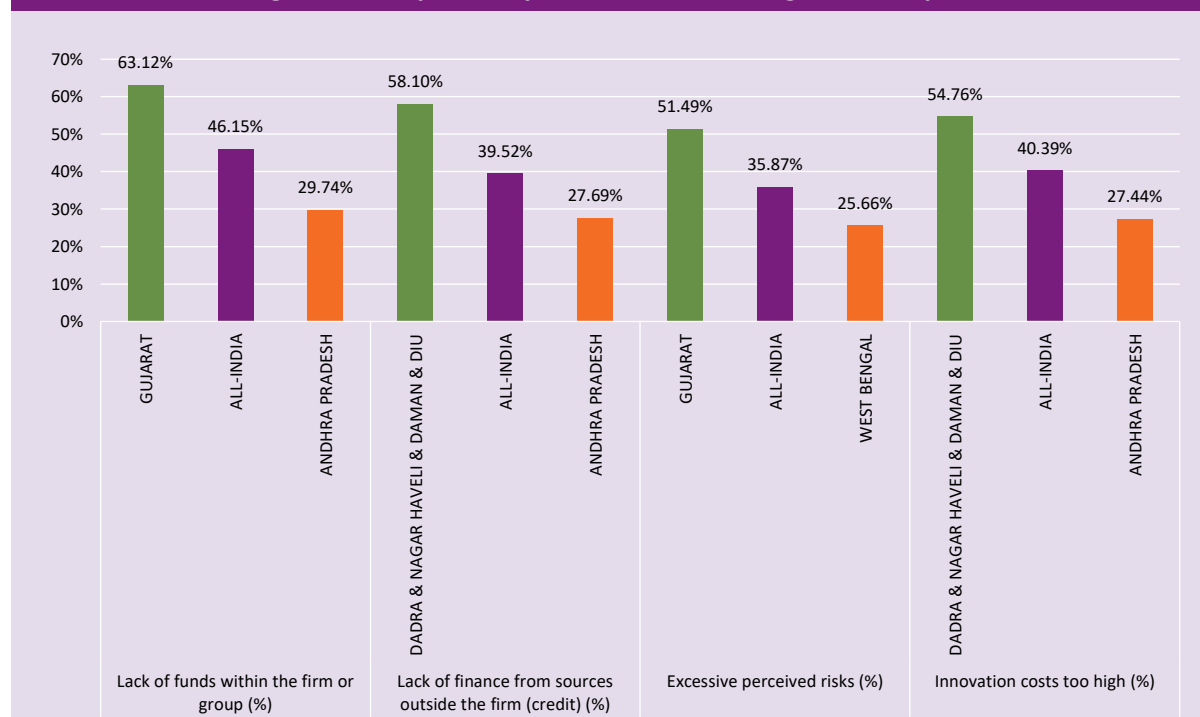
6.2. FINANCING BARRIERS

Financing Barriers mainly deals with aspects related to lack of funds, access to external finance, risk ratio to innovate and costs involved. The four indicators under this pillar are, 1) lack of funds within the group, 2) lack of external sources of finance, 3) excessive perceived risks and 4) innovation costs being too high.

6.2.1. FINANCING BARRIERS FACED BY FIRMS: STATE-WISE

The analysis of financial barriers, as depicted in Figure 6.8, highlights that the highest presence of these barriers is observed in the states of Gujarat and Dadra & Nagar Haveli and Daman & Diu, whereas the lowest presence is noted in Andhra Pradesh and West Bengal. The findings are consistent with the presence of Potential and capability barriers across all indicators.

FIGURE 6.8: Financing barriers reported by firms: states with high and low presence of barriers



Based on Figure 6.8 and Table 6.3, this report provides insights on barriers to innovation in different states of India.



Lack of funds within the firm or group: states with high & low presence of barriers

The first key barrier is the lack of internal funds, with a national average of 46.15%. States with the highest presence of this barrier are Gujarat (63.12%), Dadra & Nagar Haveli and Daman & Diu (61.90%), and Maharashtra (54.27%). In contrast, states with low presence of this barrier include Andhra Pradesh (29.74%), West Bengal (35.86%), Assam (36.99%), North-eastern States (excluding Assam) (33.59%), and Puducherry (34.88%).



Lack of finance from sources outside the firm: states with high & low presence of barriers

The second key barrier is the lack of external sources of finance, with a national average of 39.52%. States with the highest presence of this barrier are Dadra & Nagar Haveli and Daman & Diu (58.10%), Gujarat (53.96%), and Maharashtra (46.88%). In contrast, states with low presence of this barrier include Andhra Pradesh (27.69%), Odisha (31.95%), West Bengal (27.99%), North-eastern States (excluding Assam) (28.24%), and Puducherry (30.23%).

The third and fourth key barriers are excessive perceived risks and high innovation costs, with

national averages of 35.87% and 40.39%, respectively.



Excessive perceived risks: states with high & low presence of barriers

States with the highest presence of excessive perceived risks are Gujarat (51.49%), Dadra & Nagar Haveli and Daman & Diu (50.48%), and Maharashtra (43.42%), while states with low presence of this barrier include Andhra Pradesh (26.92%), Odisha (27.48%), Uttar Pradesh (29.38%), West Bengal (25.66%), North-eastern States (excluding Assam) (26.72%), and Puducherry (29.07%).



Innovation costs too high: states with high & low presence of barriers

On the other hand, states with the highest presence of high innovation costs are Dadra & Nagar Haveli and Daman & Diu (54.76%), Gujarat (54.70%), and Maharashtra (48.04%), while states with low presence of this barrier include Andhra Pradesh (27.44%), Jharkhand (32.71%), West Bengal (31.20%), North-eastern States (excluding Assam) (32.06%), and Puducherry (33.14%).

Gujarat was the common outlier across all financing related barriers, while Dadra & Nagar Haveli and Daman & Diu was an outlier in lack of finance from sources outside the firm.

FIGURE 6.9: Financing barriers reported by firms: distribution of states

Table 6.3 classifies the states into three groups based on the existence of barriers, as explained in the previous sections. The results show that Dadra & Nagar Haveli and Daman & Diu, Gujarat,

and Maharashtra have a high presence of barriers, with Telangana and Karnataka showing a moderate presence of Potential and capability barriers.

TABLE 6.3: Financing barriers reported by firms: states with high, average and low presence of barriers

States	Lack of funds within the firm or group	Lack of finance from sources outside the firm (credit)	Excessive perceived risks	Innovation costs too high
All-India	46.15%	39.52%	35.87%	40.39%
MAJOR STATES				
Andhra Pradesh	29.74%	27.69%	26.92%	27.44%
Bihar	43.71%	37.43%	35.63%	38.32%
Chhattisgarh	49.07%	43.48%	40.99%	45.96%
Gujarat	63.12%	53.96%	51.49%	54.70%
Haryana	44.28%	37.83%	34.60%	39.00%
Jharkhand	39.56%	33.02%	29.91%	32.71%
Karnataka	51.94%	43.88%	36.42%	42.39%
Kerala	50.55%	43.54%	38.38%	42.80%
Madhya Pradesh	48.96%	42.43%	33.23%	39.76%
Maharashtra	54.27%	46.88%	43.42%	48.04%

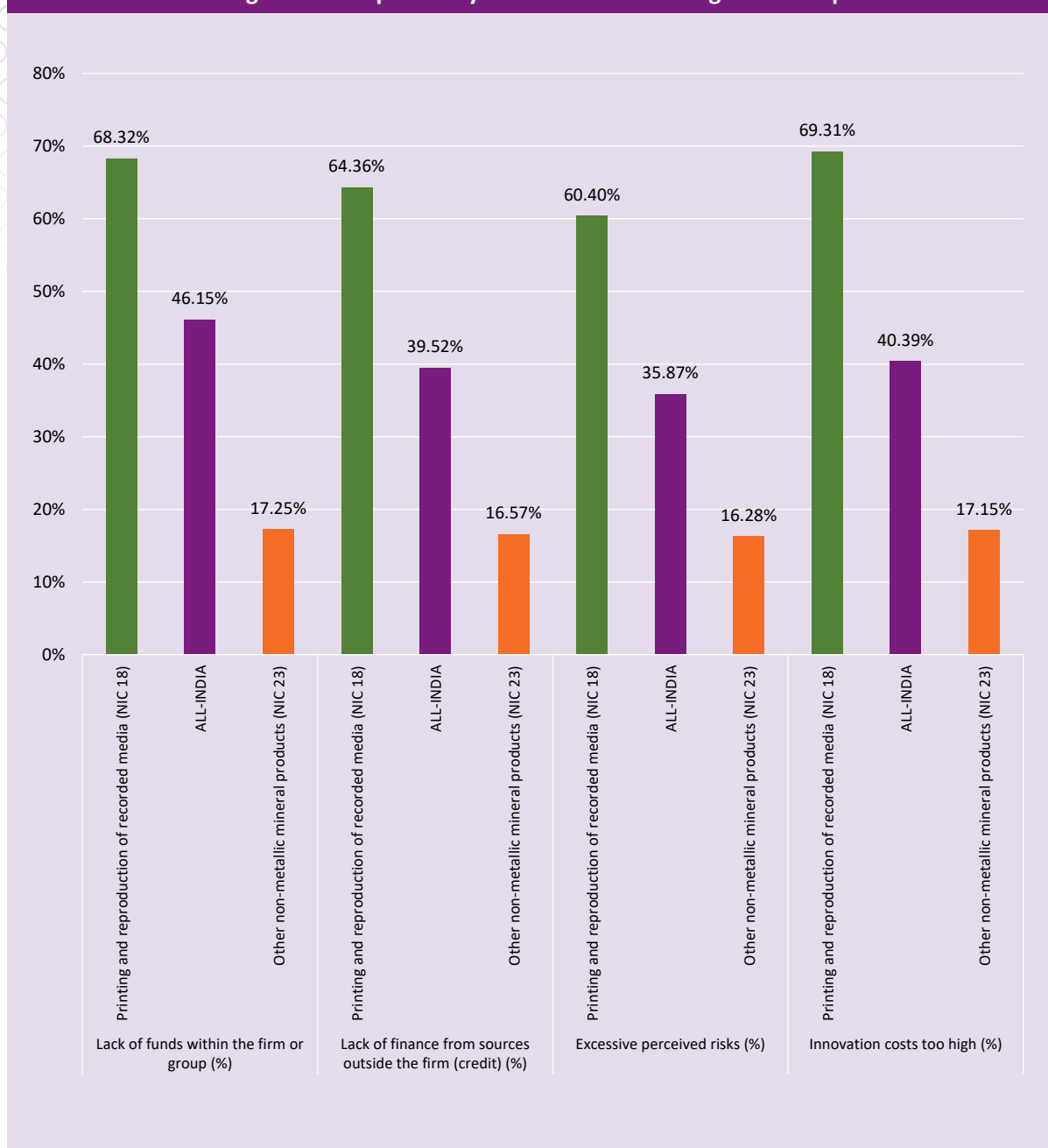
Odisha	39.62%	31.95%	27.48%	34.82%
Punjab	44.59%	38.69%	32.13%	39.02%
Rajasthan	43.64%	34.81%	35.58%	38.70%
Tamil Nadu	44.54%	37.36%	34.20%	39.08%
Telangana	47.31%	43.63%	39.09%	42.21%
Uttar Pradesh	44.63%	33.90%	29.38%	37.85%
West Bengal	35.86%	27.99%	25.66%	31.20%
HILL STATES				
Assam	36.99%	35.16%	32.42%	34.70%
Himachal Pradesh	41.59%	33.63%	31.86%	38.05%
Ner States	33.59%	28.24%	26.72%	32.06%
Uttarakhand	47.89%	39.91%	32.86%	39.44%
UT & CITY STATES				
Chandigarh	43.24%	37.84%	36.04%	37.84%
Dadra & Nagar Haveli & Daman & Diu	61.90%	58.10%	50.48%	54.76%
Goa	53.14%	42.29%	41.71%	46.29%
Jammu & Kashmir	48.91%	42.93%	38.04%	42.39%
New Delhi	47.60%	40.72%	38.62%	41.92%
Puducherry	34.88%	30.23%	29.07%	33.14%
All-India % Plus Standard Deviation	53.90%	46.86%	42.34%	46.87%
All-India % Minus Standard Deviation	38.40%	32.18%	29.40%	33.91%

Best Performers Above national average + standard deviation	Average Performers Between national average + standard deviation and national average - standard deviation	Low Performers Below national average - standard deviation
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Interestingly, many states that perform well on the IMII score exhibit a high presence of barriers, while low-performing states such as the Northeastern region (excluding Assam), Andhra Pradesh, and West Bengal have a low presence of barriers. Puducherry has been added to the list of states with a low presence of barriers, particularly in relation to financial barriers. Conversely, Odisha reported a low presence of barriers related to lack of finance from sources outside the firm and perceived excessive risks associated with financial barriers.

6.2.2. FINANCING BARRIERS FACED BY FIRMS: SECTOR-WISE

The data presented in Figure 6.10 showcases the sectors that have reported the highest and lowest levels of Potential and capability barriers. The printing and reproduction of recorded media sector has reported the highest presence of financial barriers across all the indicators, and the other non-metallic mineral products sector in the absence of financial barriers.

FIGURE 6.10: Financing barriers reported by firms: sectors with high and low presence of barriers


According to Figure 6.10 and Table 6.4, certain sectors experience significant barriers to accessing internal funds.



Lack of funds within the firm or group: sectors with high & low presence of barriers

Specifically, printing and reproduction of recorded media (68.32%), rubber and plastic

products (67.45%), wood and related products (63.64%), and chemicals and chemical products (61.75%) sectors show a high presence of this barrier. Conversely, other non-metallic mineral products (17.25%) and wholesale trade, except motor vehicles and motorcycles (25.86%) appear to have a low presence of this barrier.



Lack of finance from sources outside the firm: sectors with high & low presence of barriers

Regarding the availability of external funds, the printing and reproduction of recorded media (64.36%), rubber and plastic products (63.65%), wood and related products (56.49%), and chemicals and chemical products (55.53%) sectors reported a high presence of this barrier. Meanwhile, other non-metallic mineral products (16.57%) and wholesale trade, except for motor vehicles and motorcycles (22.84%) reported a low presence of the barrier.



Excessive perceived risks: sectors with high & low presence of barriers

With regards to the excessive perceived risks barrier indicator, sectors such as printing and reproduction of recorded media (60.40%), rubber and plastic products (54.45%), other and diversified manufacturing (54.10%), wood and related products (51.05%), and chemicals and chemical products (51.61%) reported a high presence of this barrier. In contrast, other non-metallic mineral products (16.28%) and wholesale trade, except for motor vehicles and motorcycles (19.40%) had a low presence of the barrier.



Innovation costs too high: sectors with high & low presence of barriers

Finally, the innovation costs being too high indicator was particularly prevalent in sectors such as printing and reproduction of recorded media (69.31%), wood and related products (57.79%), rubber and plastic products (56.35%), other and diversified manufacturing (56.28%), and chemicals and chemical products (56.22%). On the other hand, other non-metallic mineral products (17.15%) and wholesale trade, except for motor vehicles and motorcycles (19.83%), reported a low presence of the barrier.

The table 6.4 classifies the sectors based on the existence of barriers into three groups as explained above. According to Table 19, printing and reproduction of recorded media, rubber and plastics products, chemicals and chemical products and wood and related products are identified as sectors with an overall high presence of financial barriers. Other non-metallic mineral products, wholesale trade, and except motor vehicles and motorcycle sectors are identified as sectors with an overall low presence of financial barriers.

TABLE 6.4: Financing barriers reported by firms: sectors with high, average and low presence of barriers

States	Lack of funds within the firm or group	Lack of finance from sources outside the firm (credit)	Excessive perceived risks	Innovation costs too high
All-India	46.15%	39.52%	35.87%	40.39%
Food and Beverages (NIC 10 & 11)	40.01%	31.89%	28.10%	34.22%
Textiles and Apparels (NIC 13 & 14)	53.54%	44.72%	43.78%	50.08%
Wood and related products (NIC 16)	63.64%	56.49%	51.95%	57.79%
Paper and related products (NIC 17)	54.86%	51.04%	45.83%	52.08%
Printing and reproduction of recorded media (NIC 18)	68.32%	64.36%	60.40%	69.31%
Chemicals and chemical products (NIC 20)	61.75%	55.53%	51.61%	56.22%
Pharmaceuticals, medicinal chemical and botanical products (NIC 21)	37.07%	28.57%	28.57%	32.43%
Rubber and plastics products (NIC 22)	67.45%	63.65%	54.45%	56.35%
Other non-metallic mineral products (NIC 23)	17.25%	16.57%	16.28%	17.15%
Basic metals (NIC 24)	38.36%	31.51%	27.63%	34.02%
Fabricated metal products, except machinery and equipment (NIC 25)	58.27%	43.65%	38.61%	43.17%
Computer, Electronic and Electrical Equipment (NIC 26 & 27)	55.74%	43.98%	39.22%	47.90%
Machinery and equipment (NIC 28)	61.46%	57.14%	50.50%	55.15%
Motor vehicles, trailers and semi-trailers (NIC 29)	33.93%	25.00%	25.00%	30.36%
Other and Diversified Manufacturing (NIC 32 & 34)	60.11%	54.64%	54.10%	56.28%
Wholesale and retail trade and repair of motor vehicles and motorcycles (NIC 45)	38.69%	30.36%	26.79%	31.55%
Wholesale trade, except of motor vehicles and motorcycles (NIC 46)	25.86%	22.84%	19.40%	19.83%
All-India % Plus Standard Deviation	61.50%	54.67%	49.69%	55.18%
All-India % Minus Standard Deviation	30.80%	24.37%	22.05%	25.60%

Best Performers

Above national average + standard deviation

Average Performers

Between national average + standard deviation and national average - standard deviation

Low Performers

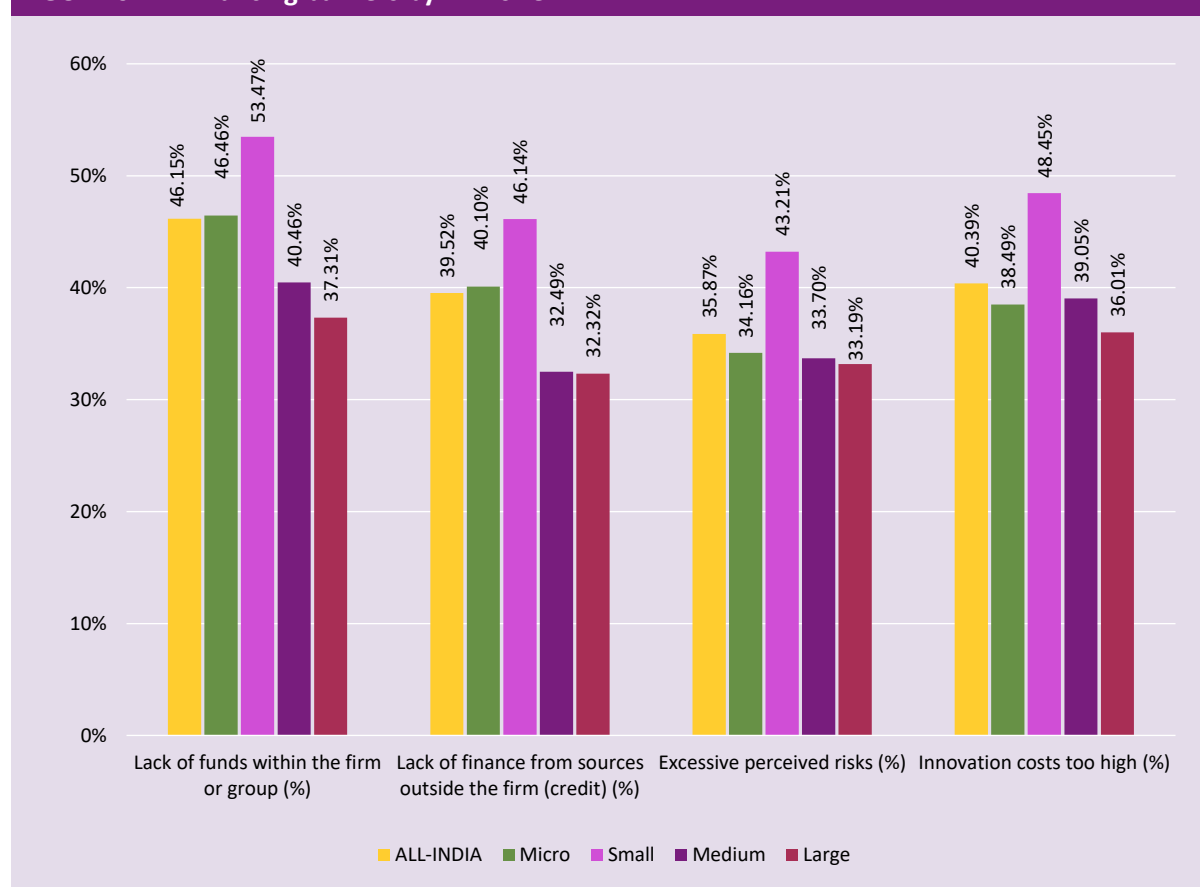
Below national average - standard deviation

6.2.3. FINANCING BARRIERS FACED BY FIRMS: SIZE-WISE

Figure 6.11 highlights the financial barriers reported by different size bins, indicating that small-sized firms have reported the highest presence of financial barriers across all indicators. In contrast, large-sized firms have reported a lower presence of financial barriers

across all indicators. Specifically, lack of internal funds availability has been reported as a significant barrier by a majority of firms, regardless of their size. While the difference is not substantial, it is noteworthy that all size bins tend to report a lower presence of excessive perceived risks, as compared to other indicators under this pillar.

FIGURE 6.11: Financing barriers by firm size



Based on the data, a significant percentage of firms of all sizes reported facing financial barriers in the form of lack of internal funds, lack of external finance, excessive perceived risks, and high innovation costs. Specifically, over half of small firms reported a lack of internal funds, while nearly half of micro firms reported a lack of external finance. In terms of excessive

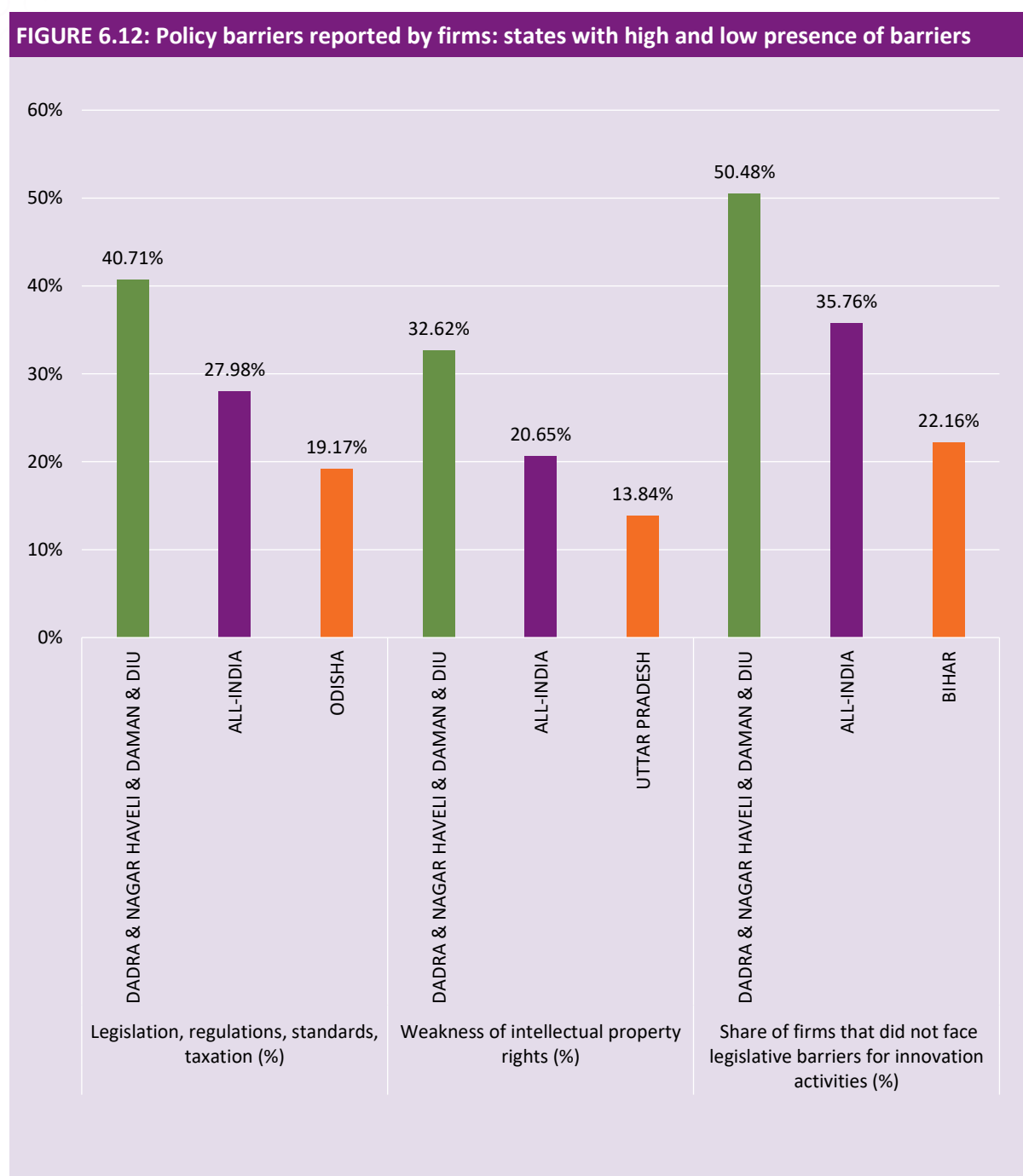
perceived risks, small firms were the most likely to report this as a barrier. Meanwhile, a significant proportion of small firms also reported high innovation costs as a financial barrier. These findings suggest that financial constraints remain a major challenge for firms across all sizes and may inhibit their ability to innovate and grow.

6.3. POLICY BARRIERS

6.3.1. POLICY BARRIERS FACED BY FIRMS: STATE-WISE

Policy Barrier Pillar consists of three indicators: Share of firms facing regulations, standards,

taxation related barriers, share of firms facing weakness of Intellectual property rights, and share of firms facing legislative barriers for innovation activities. The above graph depicts the percentage of states with a high presence of barriers, all-India average and states with a low presence of barriers.



The data presented in figure 6.12 and table 6.5 highlights the variation in the presence of barriers faced by firms operating in different states in India.



Regulations, standards, taxation related barriers: states with high & low presence of barriers

The national average for firms facing regulations, standards, and taxation related barriers is reported as 28%. However, states with a high presence of such barriers include Dadra & Nagar Haveli and Daman & Diu (40.71%), Gujarat (35.40%), Chhattisgarh (34.78%), and Maharashtra (33.72%). In contrast, states with a low presence of such barriers include Odisha (19.17%), Andhra Pradesh (20.77%), Himachal Pradesh (20.80%), West Bengal (20.99%), and Uttar Pradesh (22.60%).



Weakness of intellectual property rights: states with high & low presence of barriers

Regarding firms facing weakness in intellectual property rights, the national average reported is 21%, but states with a high presence of such barriers include Dadra & Nagar Haveli and Daman & Diu (32.62%), Gujarat (30.94%), Maharashtra (25.87%), Telangana (25.78%), and Goa (26.29%). In contrast, states with a low presence of such barriers include Uttar Pradesh

(13.84%), Andhra Pradesh (14.36%), Odisha (15.34%), Puducherry (15.70%), and West Bengal (15.74%).



Legislative barriers for innovation activities: states with high & low presence of barriers

Lastly, the data indicates that the national average for firms facing legislative barriers for innovation activities is 36%. States with a high presence of such barriers include Dadra & Nagar Haveli and Daman & Diu (50.48%), Himachal Pradesh (46.46%), Gujarat (45.79%), and Goa (44.57%). In contrast, states with a low presence of such barriers include Bihar (22.16%), North-eastern States (Exc. Assam) (22.90%), Assam (23.74%), Andhra Pradesh (24.87%), and Jharkhand (27.73%).

The below table indicates states with a High Presence of Barriers (Red Color), Average Performing States (Yellow Color) and States with a Low Presence of Barriers (Green Color). States with a High Presence of Barriers are those states whose indicator values (%) are greater than the sum of the national average & standard deviation of the indicator values of all states. States with a Low Presence of Barriers are those states whose indicator values (%) are less than the national average minus the standard deviation of the indicator values of all states.

TABLE 6.5: Policy barriers reported by firms: states with high, average and low presence of barriers

States	Legislation, regulations, standards, taxation	Weakness of intellectual property rights	Share of firms that DID NOT face legislative barriers for innovation activities
All-India	27.98%	20.65%	35.76%
MAJOR STATES			
Andhra Pradesh	20.77%	14.36%	24.87%
Bihar	23.35%	17.37%	22.16%
Chhattisgarh	34.78%	23.91%	40.06%
Gujarat	35.40%	30.94%	45.79%
Haryana	25.22%	16.42%	38.12%
Jharkhand	25.55%	18.69%	27.73%
Karnataka	28.96%	21.49%	40.00%
Kerala	29.15%	22.88%	41.70%
Madhya Pradesh	26.71%	19.58%	35.31%
Maharashtra	33.72%	25.87%	42.49%
Odisha	19.17%	15.34%	33.55%
Punjab	24.26%	21.31%	28.20%
Rajasthan	25.97%	17.14%	31.43%
Tamil Nadu	27.87%	18.10%	42.82%
Telangana	32.29%	25.78%	35.41%
Uttar Pradesh	22.60%	13.84%	31.36%
West Bengal	20.99%	15.74%	31.78%
HILL STATES			
Assam	29.68%	19.18%	23.74%
Himachal Pradesh	20.80%	16.81%	46.46%
Ner States	26.72%	16.03%	22.90%
Uttarakhand	24.41%	17.37%	30.52%
UT & CITY STATES			
Chandigarh	27.93%	21.62%	34.23%
Dadra & Nagar Haveli & Daman & Diu	40.71%	32.62%	50.48%
Goa	32.57%	26.29%	44.57%
Jammu & Kashmir	32.07%	23.37%	32.61%
New Delhi	32.63%	21.56%	41.32%
Puducherry	24.42%	15.70%	28.49%
All-India % Plus Standard Deviation	33.30%	25.62%	43.53%
All-India % Minus Standard Deviation	22.66%	15.68%	27.99%

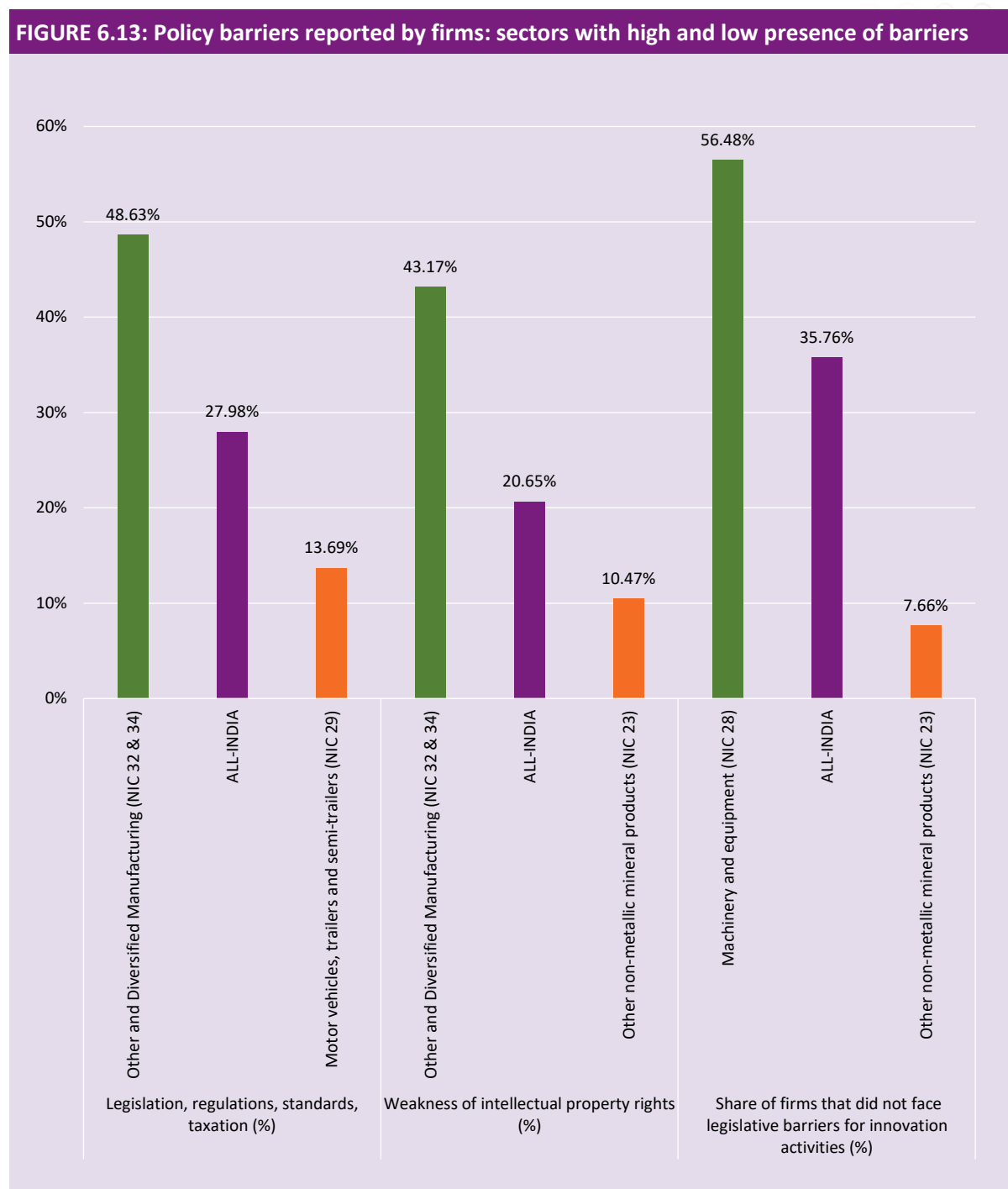
Best Performers
Above national average + standard deviation

Average Performers
Between national average + standard deviation and national average - standard deviation

Low Performers
Below national average - standard deviation

6.3.2. POLICY BARRIERS FACED BY FIRMS: SECTOR-WISE

Figure 6.13 depicts the percentage of sectors with a high presence of barriers, the all-India average and sectors with a low presence of barriers.



According to Figure 6.13 and Table 6.6, firms operating in certain sectors face various types of barriers.



Regulations, standards, taxation related barriers: sectors with high & low presence of barriers

Sectors with a high presence of regulations, standards, and taxation related barriers are other and diversified manufacturing (NIC 32 & 34) with 48.63%, followed by chemicals and chemical products (NIC 20) with 43.55%, rubber and plastics products (NIC 22) with 43.36%, printing and reproduction of recorded media (NIC 18) with 42.57%, wood and related products (NIC 16) with 42.21%, and machinery and equipment (NIC 28) with 41.53%. On the other hand, sectors with a low presence of these barriers are motor vehicles, trailers and semi-trailers (NIC 29) with 13.69%, followed by other non-metallic mineral products (NIC 23) with 14.24%.



Weakness of intellectual property rights: sectors with high & low presence of barriers

Regarding firms facing weakness of Intellectual Property (IP) rights, the sectors with the highest presence of barriers are other and diversified manufacturing (NIC 32 & 34) with 43.17%, followed by rubber and plastics products (NIC 22) with 34.31%, machinery and equipment (NIC 28) with 33.55%, chemicals and chemical products (NIC 20) with 33.41%, wood and

related products (NIC 16) with 31.82%, and paper and related products (NIC 17) with 31.25%.



Legislative barriers for innovation activities: sectors with high & low presence of barriers

Lastly, firms facing legislative barriers for innovation activities in certain sectors are highly prevalent. Sectors with a high presence of these barriers are machinery and equipment (NIC 28) with 56.48%, followed by rubber and plastics products (NIC 22) with 54.01%, printing and reproduction of recorded media (NIC 18) with 52.48%, and other and diversified manufacturing (NIC 32 & 34) with 51.37%. On the other hand, sectors with a low presence of these barriers are other non-metallic mineral products (NIC 23) with 7.66%, followed by wholesale trade, except motor vehicles and motorcycles (NIC 46) with 15.09%, and wholesale and retail trade and repair of motor vehicles and motorcycles (NIC 45) with 20.24%.

These findings highlight the need for policymakers to take sector-specific approaches to address the barriers faced by firms, including addressing regulatory burdens, strengthening IP protections, and reducing legislative barriers for innovation activities, to support economic growth and development.

TABLE 6.6: Policy barriers reported by firms: sectors with high, average and low presence of barriers

States	Regulations, standards & taxation	Weakness of intellectual property rights	Legislative barriers for innovation activities
All-India	27.98%	20.65%	35.76%
Food and Beverages (NIC 10 & 11)	21.77%	14.18%	39.15%
Textiles and Apparels (NIC 13 & 14)	29.61%	19.84%	45.20%
Wood and related products (NIC 16)	42.21%	31.82%	26.62%
Paper and related products (NIC 17)	38.19%	31.25%	31.25%
Printing and reproduction of recorded media (NIC 18)	42.57%	30.69%	52.48%
Chemicals and chemical products (NIC 20)	43.55%	33.41%	48.62%
Pharmaceuticals, medicinal chemical and botanical products (NIC 21)	20.85%	15.83%	37.45%
Rubber and plastics products (NIC 22)	43.36%	34.31%	54.01%
Other non-metallic mineral products (NIC 23)	14.24%	10.47%	7.66%
Basic metals (NIC 24)	19.18%	11.87%	29.00%
Fabricated metal products, except machinery and equipment (NIC 25)	34.05%	29.02%	49.40%
Computer, Electronic and Electrical Equipment (NIC 26 & 27)	27.17%	19.05%	36.13%
Machinery and equipment (NIC 28)	41.53%	33.55%	56.48%
Motor vehicles, trailers, and semi-trailers (NIC 29)	13.69%	12.50%	30.36%
Other and Diversified Manufacturing (NIC 32 & 34)	48.63%	43.17%	51.37%
Wholesale and retail trade and repair of motor vehicles and motorcycles (NIC 45)	19.05%	11.31%	20.24%
Wholesale trade, except of motor vehicles and motorcycles (NIC 46)	18.10%	12.93%	15.09%
All-India % Plus Standard Deviation	39.92%	31.19%	50.22%
All-India % Minus Standard Deviation	16.04%	10.11%	21.30%

Best Performers

Above national average + standard deviation

Average Performers

Between national average + standard deviation and national average - standard deviation

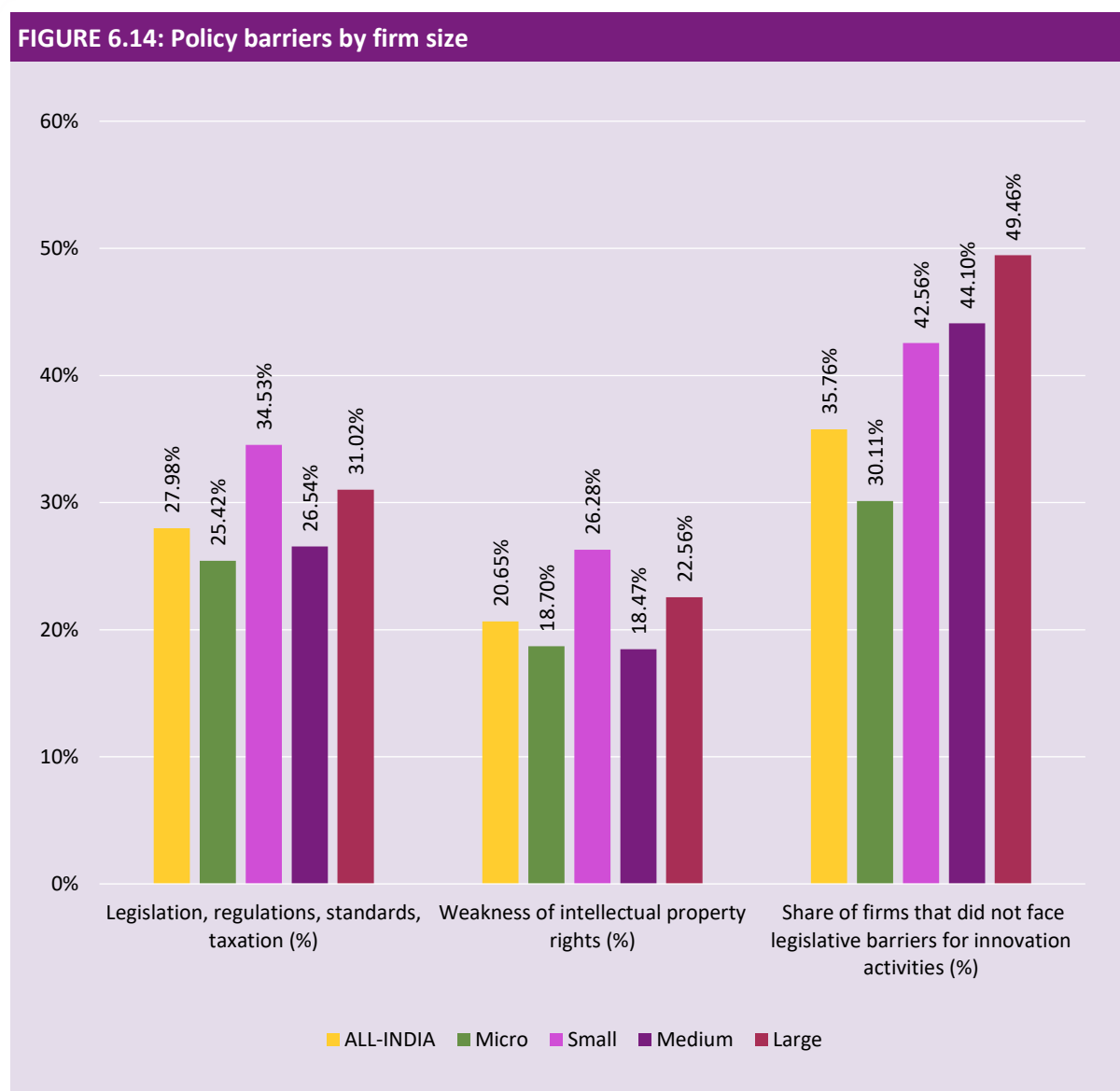
Low Performers

Below national average - standard deviation

6.3.3. POLICY BARRIERS FACED BY FIRMS: SIZE-WISE

The below graph depicts the % of each indicator reported across all size bins. According to the data presented, a significant proportion of firms

face different types of barriers in their operations. For instance, in terms of regulations, standards, and taxation-related barriers, the majority of firms face these challenges in the small and large size bins, with 35% and 31% reported, respectively



Meanwhile, for firms facing weakness in intellectual property rights, the small size bin has the highest percentage, with 26% reported, followed by the large size bin with 23% reported. Finally, the large size bin has the highest

percentage of firms facing legislative barriers for innovation activities, with 49% reported, followed by the medium size bin with 44% reported, while the micro size bin has the lowest percentage, with 30% reported.

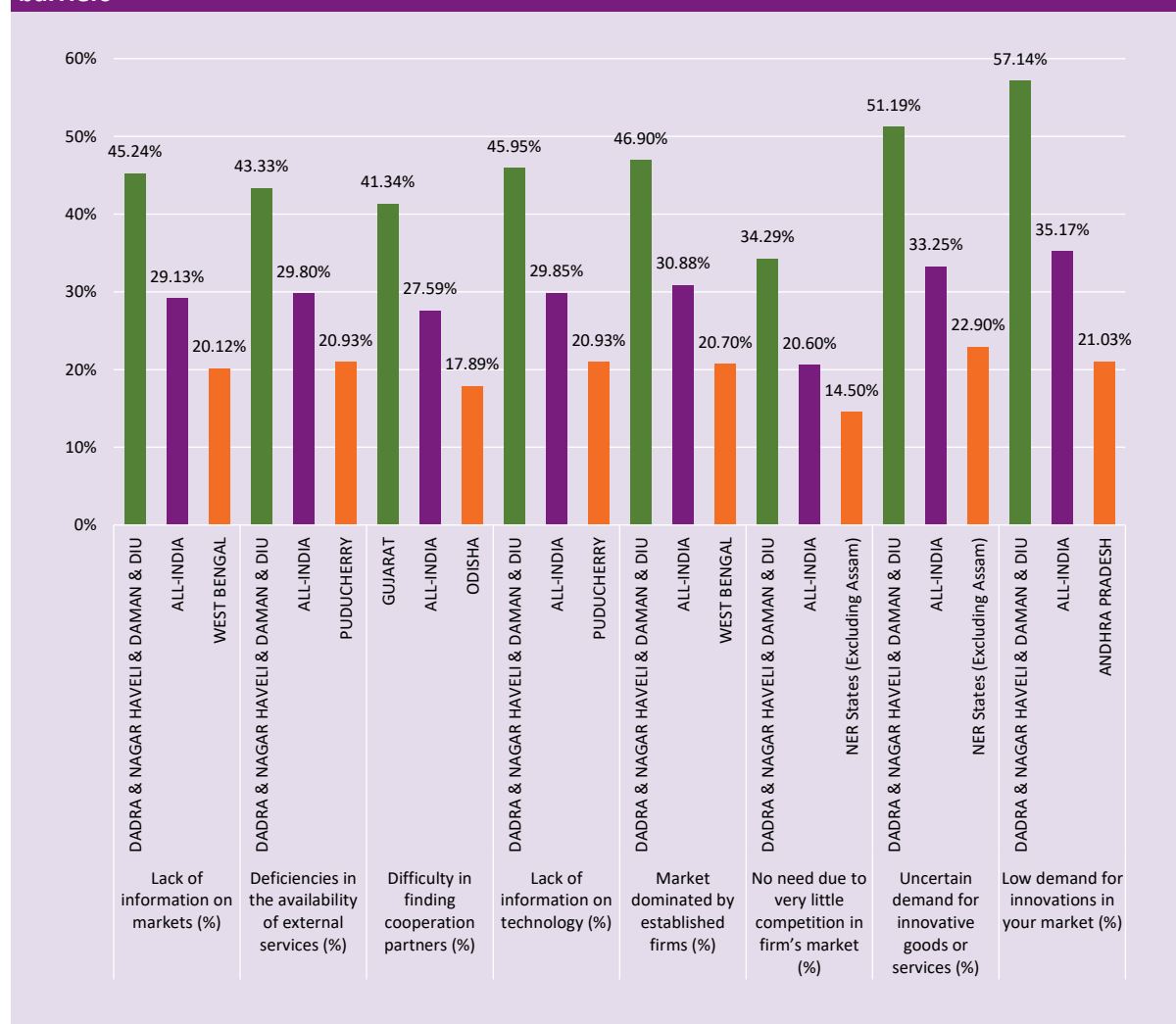
6.4. MARKET & LINKAGE BARRIERS

6.4.1. MARKET & LINKAGE BARRIERS FACED BY FIRMS: STATE-WISE

Market & Linkage Barrier Pillar consists of eight indicators: share of firms facing lack of information on markets, share of firms facing deficiencies in the availability of external services, share of firms facing difficulty in finding

cooperation partners, share of firms facing lack of information on technology, share of firms facing market dominance by established firms, share of firms facing no need due to very little competition in firm's market, share of firms facing uncertain demand for innovative goods or services, share of firms facing low demand for innovations in your market. The below graph depicts the percentage of states with a high presence of barriers, the all-India average and states with a low presence of barriers.

FIGURE 6.15: Market & linkage barriers reported by firms: states with high and low presence of barriers





Lack of information on markets: states with high & low presence of barriers

According to Figure 6.15 and Table 6.7, the national average reported for lack of information on markets is 29%. However, states with a high presence of barriers, namely Dadra & Nagar Haveli and Daman & Diu, report 45.24%, followed by Gujarat at 42.82%. In contrast, states with a low presence of barriers such as West Bengal report 20.12%, followed by Odisha at 20.13%, Puducherry at 21.51%, and Andhra Pradesh at 21.54%.



Deficiencies in the availability of external services: states with high & low presence of barriers

Similarly, deficiencies in the availability of external services are reported at a national average of 30%. States with a high presence of barriers, such as Dadra & Nagar Haveli and Daman & Diu at 43.33%, followed by Gujarat at 42.33% and Chhattisgarh at 36.02%, whereas states with a low presence of barriers like Puducherry report 20.93%, followed by West Bengal at 21.87%, Odisha at 22.04%, Uttar Pradesh at 22.88%, and Uttarakhand at 23.47%.



Difficulty in finding cooperation partners: states with high & low presence of barriers

Difficulty in finding cooperation partners is reported at a national average of 28%, BUT & City States with a high presence of barriers, such as Dadra & Nagar Haveli and Daman & Diu at 40.71%, followed by Gujarat at 41.34%, Maharashtra at 33.72%, and Chhattisgarh at 33.85%. States with a low presence of barriers, such as Odisha report 17.89%, followed by West

Bengal at 19.24%, Puducherry at 19.77%, Uttarakhand at 20.19%, and the North-eastern States (Excl. Assam) at 20.61%.



Lack of information on technology: states with high & low presence of barriers

Finally, the national average reported for a lack of information on technology is 30%. States with a high presence of barriers, such as Dadra & Nagar Haveli and Daman & Diu at 45.95%, followed by Gujarat at 44.80%, and Maharashtra at 37.41%. States with a low presence of barriers, such as Puducherry report 20.93%, followed by Andhra Pradesh at 21.54%, Odisha at 21.73%, West Bengal at 21.87%, and Himachal Pradesh at 23.01%.



Market dominated by established firms: states with high & low presence of barriers

According to the data, the national average for market dominance by established firms is 31%. However, states with high barriers to entry include Dadra & Nagar Haveli and Daman & Diu (46.90%), Gujarat (43.56%), Telangana (39.09%), and Maharashtra (38.11%). In contrast, states with a low presence of barriers are West Bengal (20.70%), Andhra Pradesh (21.79%), North-eastern States (Excl. Assam) (22.90%), and Odisha (24.28%).



No need due to very little competition in firm's market: states with high & low presence of barriers

For no need due to very little competition in the firm's market, the national average is 21%. States with high barriers to entry include Dadra & Nagar Haveli and Daman & Diu (34.29%),

Gujarat (30.20%), and Maharashtra (26.33%). On the other hand, states with a low presence of barriers are North-eastern States (Excl. Assam) (14.50%), Uttarakhand (14.55%), West Bengal (14.58%), Andhra Pradesh (14.87%), Puducherry (15.12%), and Odisha (15.34%).



Uncertain demand for innovative goods or services: states with high & low presence of barriers

Regarding uncertain demand for innovative goods or services, the national average is 33%. States with high barriers to entry include Dadra & Nagar Haveli and Daman & Diu (51.19%) and Gujarat (46.04%). However, states with a low presence of barriers are North-eastern States (Excl. Assam) (22.90%), Andhra Pradesh (23.33%), West Bengal (24.20%), and Uttar Pradesh (25.71%).



Low demand for innovations in the market: states with high & low presence of barriers

Finally, for low demand for innovations in the market, the national average is 35%. States with high barriers to entry include Dadra & Nagar Haveli and Daman & Diu (57.14%), Gujarat (46.53%), and Chhattisgarh (44.72%). Meanwhile, states with a low presence of barriers are Andhra Pradesh (21.03%), North-eastern States (Exc. Assam) (24.43%), West Bengal (26.82%), and Himachal Pradesh (27.43%).

Dadra & Nagar Haveli and Daman & Diu are common outliers for barriers like market dominated by established firms, no need due to very little competition in firm's market, uncertain demand for innovative goods and services and low demand for innovations in your market.

FIGURE 6.16: Market and linkage barrier: distribution of states

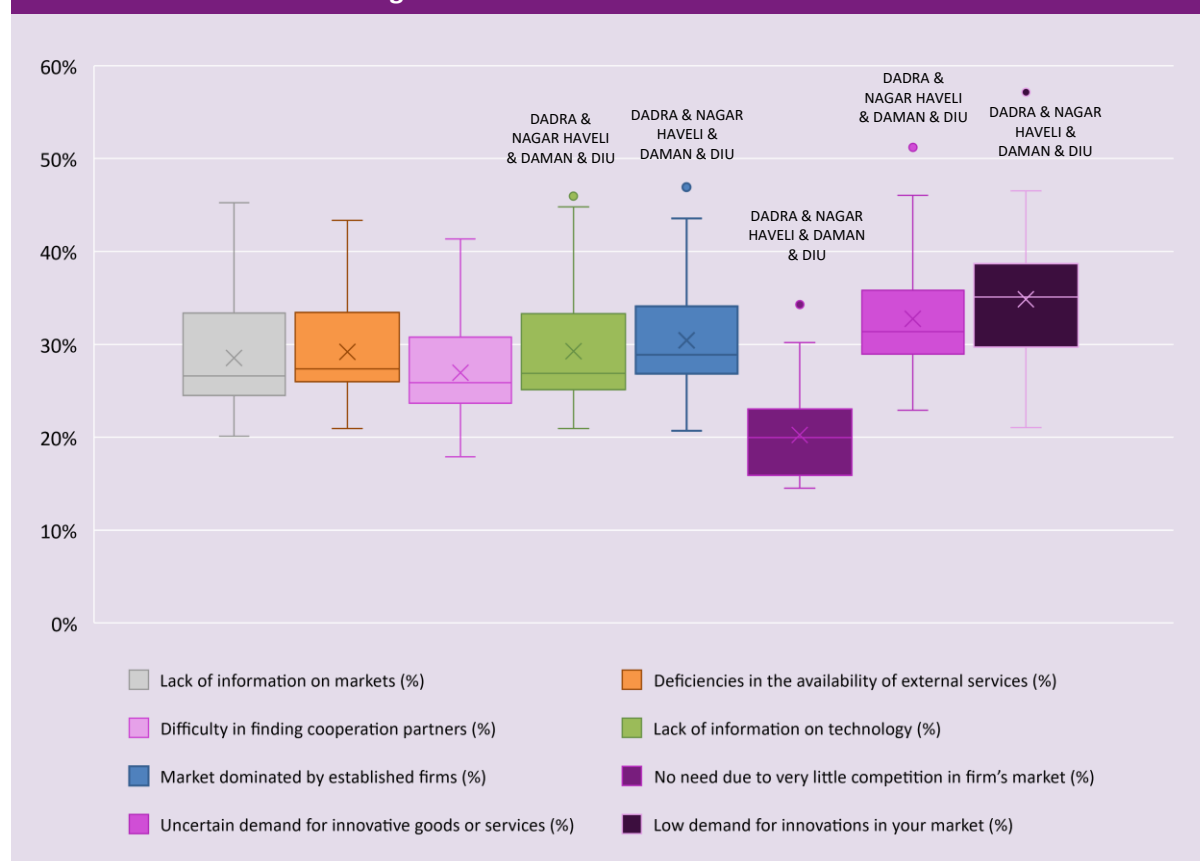


TABLE 6.7: Market & linkage barriers reported by firms: states with high, average and low presence of barriers

States	Lack of information on markets	Deficiencies in external services	Difficulty in finding cooperation partners	Lack of information on technology	Market dominated by established firms	No incentive to innovate due to low competition	Uncertain demand for innovative goods or services	Low demand for innovations in the market
All-India	29.13%	29.80%	27.59%	29.85%	30.88%	20.60%	33.25%	35.17%
MAJOR STATES								
Andhra Pradesh	21.54%	25.38%	23.59%	21.54%	21.79%	14.87%	23.33%	21.03%
Bihar	26.35%	26.65%	24.85%	24.85%	29.04%	18.26%	27.25%	31.74%
Chhattisgarh	34.78%	36.02%	33.85%	35.71%	34.16%	22.98%	39.75%	44.72%
Gujarat	42.82%	42.33%	41.34%	44.80%	43.56%	30.20%	46.04%	46.53%
Haryana	26.39%	27.27%	24.63%	26.10%	27.27%	16.72%	31.09%	30.21%
Jharkhand	26.79%	27.41%	25.86%	26.79%	27.10%	17.45%	29.91%	33.33%
Karnataka	30.45%	31.34%	27.46%	29.25%	28.96%	20.30%	34.33%	34.03%
Kerala	30.63%	34.69%	33.21%	32.10%	33.95%	22.88%	35.42%	37.64%
Madhya Pradesh	25.22%	27.60%	26.41%	26.71%	28.19%	21.66%	30.27%	40.65%
Maharashtra	35.33%	34.64%	33.72%	37.41%	38.11%	26.33%	39.72%	37.88%
Odisha	20.13%	22.04%	17.89%	21.73%	24.28%	15.34%	31.31%	35.46%
Punjab	24.26%	26.56%	23.93%	26.23%	27.21%	19.67%	32.46%	37.05%
Rajasthan	25.71%	26.49%	25.19%	26.49%	25.97%	15.84%	29.35%	29.61%
Tamil Nadu	28.74%	30.75%	25.86%	29.89%	28.16%	18.10%	29.60%	28.45%
Telangana	34.56%	33.14%	31.73%	36.26%	39.09%	24.65%	36.54%	35.41%
Uttar Pradesh	23.16%	22.88%	22.32%	24.58%	24.58%	16.10%	25.71%	29.10%
West Bengal	20.12%	21.87%	19.24%	21.87%	20.70%	14.58%	24.20%	26.82%
HILL STATES								
Assam	26.94%	26.03%	24.20%	26.94%	32.88%	21.00%	31.05%	31.96%
Himachal Pradesh	25.22%	26.55%	23.89%	23.01%	30.97%	16.37%	31.42%	27.43%
Ner States	25.95%	25.95%	20.61%	25.95%	22.90%	14.50%	22.90%	24.43%
Uttarakhand	23.47%	23.47%	20.19%	26.29%	28.64%	14.55%	27.23%	30.05%
UT & CITY STATES								
Chandigarh	26.13%	26.13%	27.03%	30.63%	28.83%	24.32%	28.83%	35.14%
Dadra & Nagar Haveli & Daman & Diu	45.24%	43.33%	40.71%	45.95%	46.90%	34.29%	51.19%	57.14%
Goa	34.29%	34.29%	29.71%	33.71%	36.57%	24.57%	39.43%	40.57%
Jammu & Kashmir	29.35%	30.43%	28.26%	29.35%	29.35%	22.83%	35.87%	40.22%
New Delhi	35.03%	33.53%	31.14%	34.13%	35.03%	23.05%	35.63%	35.03%
Puducherry	21.51%	20.93%	19.77%	20.93%	26.74%	15.12%	33.72%	38.95%
All-India % Plus Standard Deviation	35.52%	35.58%	33.58%	36.37%	37.27%	25.64%	39.88%	42.74%
All-India % Minus Standard Deviation	22.74%	24.02%	21.60%	23.33%	24.49%	15.56%	26.62%	27.60%

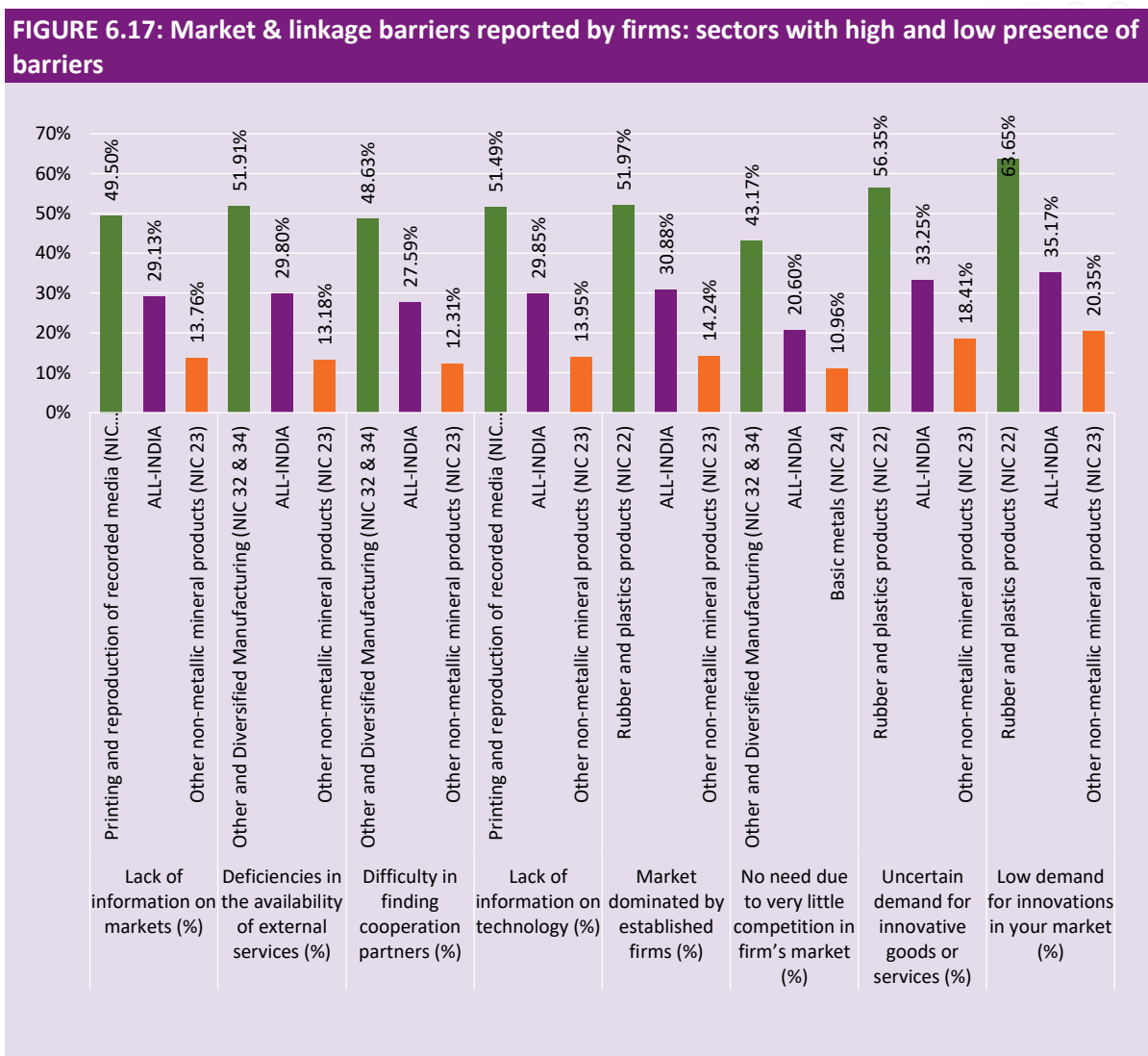
Best Performers
Above national average + standard deviation

Average Performers
Between national average + standard deviation and national average - standard deviation

Low Performers
Below national average - standard deviation

6.4.2. MARKET & LINKAGE BARRIERS FACED BY FIRMS: SECTOR-WISE

The below graph depicts the % of sector with a high presence of barriers, an all-India average and sector with low presence of barriers.



The analysis of Figure 6.17 and Table 6.8 provides insights into the presence of barriers in various sectors in India.

- Lack of information on markets: sectors with high & low presence of barriers**

One of the barriers identified is the lack of information on markets, and the sectors with high presence of such barriers are printing and reproduction of recorded media

(NIC 18), other and diversified manufacturing (NIC 32 & 34), rubber and plastics products (NIC 22), chemicals and chemical products (NIC 20), wood and related products (NIC 16), and machinery and equipment (NIC 28). In contrast, the sector with a low presence of barriers in this regard is other non-metallic mineral products (NIC 23).

- **Deficiencies in the availability of external services: sectors with high & low presence of barriers**

Another barrier identified is deficiencies in the availability of external services. Sectors with high presence of such barriers are other and diversified manufacturing (NIC 32 & 34), rubber and plastics products (NIC 22), wood and related products (NIC 16), printing and reproduction of recorded media (NIC 18), machinery and equipment (NIC 28), and chemicals and chemical products (NIC 20). On the other hand, sectors with a low presence of barriers in this regard are other non-metallic mineral products (NIC 23), followed by wholesale trade, except motor vehicles and motorcycles (NIC 46).

- **Difficulty in finding cooperation partners: sectors with high & low presence of barriers**

The difficulty in finding cooperation partners is yet another barrier identified, and sectors with high presence of such barriers are other and diversified manufacturing (NIC 32 & 34), rubber and plastics products (NIC 22), wood and related products (NIC 16), machinery and equipment (NIC 28), and chemicals and chemical products (NIC 20). The sectors with a low presence of barriers in this regard are other non-metallic mineral products (NIC 23) followed by motor vehicles, trailers and semi-trailers (NIC 29).

- **Lack of information on technology: sectors with high & low presence of barriers**

Lastly, the lack of information on technology is also identified as a barrier, and sectors with high presence of such barriers are printing and reproduction of recorded media

(NIC 18), other and diversified manufacturing (NIC 32 & 34), chemicals and chemical products (NIC 20), rubber and plastics products (NIC 22), wood and related products (NIC 16), and machinery and equipment (NIC 28). Sectors with a low presence of barriers in this regard are other non-metallic mineral products (NIC 23) followed by wholesale trade, except motor vehicles and motorcycles (NIC 46).

- **Market dominance by established firms: sectors with high & low presence of barriers**

Market dominance by established firms varies between sectors depending on the presence of barriers to entry and demand for innovation. Sectors with a high presence of barriers such as rubber and plastics products (NIC 22), printing and reproduction of recorded media (NIC 18), chemicals and chemical products (NIC 20), other and diversified Manufacturing (NIC 32 & 34), and machinery and equipment (NIC 28) tend to be dominated by established firms due to the high entry barriers. On the other hand, sectors with a low presence of barriers such as other non-metallic mineral products (NIC 23) and wholesale and retail trade and repair of motor vehicles and motorcycles (NIC 45) tend to have more competition.

- **No need due to very little competition in firm's market: sectors with high & low presence of barriers**

Established firms tend to dominate markets where there is little competition due to the lack of need to compete for market share. Sectors such as other and diversified manufacturing (NIC 32 & 34), rubber and plastics products (NIC 22), machinery and

equipment (NIC 28), and chemicals and chemical products (NIC 20) fall into this category. These industries are dominated by a few large players who have established their dominance in the market over time and have little incentive to innovate or improve their products.

- **Uncertain demand for innovative goods or services: sectors with high & low presence of barriers**

In sectors where demand for innovative goods or services is uncertain, such as rubber and plastics products (NIC 22), other and diversified manufacturing (NIC 32 & 34), chemicals and chemical products (NIC 20), and wood and related products (NIC 16), established firms tend to dominate. This is because the high entry barriers make it difficult for new players to enter the market,

and established firms have the resources to invest in research and development to develop innovative products.

- **Low demand for innovations in your market: sectors with high & low presence of barriers**

Finally, in sectors where there is low demand for innovations, such as rubber and plastics products (NIC 22), chemicals and chemical products (NIC 20), other and diversified manufacturing (NIC 32 & 34), and printing and reproduction of recorded media (NIC 18), established firms again tend to dominate. These industries are characterized by a few large players who have been able to maintain their market dominance due to their ability to produce goods at a lower cost than new entrants.

TABLE 6.8: Market & linkage barriers reported by firms: sectors with high, average and low presence of barriers

States	Lack of information on markets	Deficiencies in external services	Difficulty in finding cooperation partners	Lack of information on technology	Market dominated by established firms	No incentive to innovate due to low competition	Uncertain demand for innovative goods or services	Low demand for innovations in the market
All-India	29.13%	29.80%	27.59%	29.85%	30.88%	20.60%	33.25%	35.17%
Food and Beverages (NIC 10 & 11)	20.37%	23.70%	21.50%	20.51%	24.03%	13.72%	24.77%	27.90%
Textiles and Apparels (NIC 13 & 14)	35.12%	35.28%	33.39%	35.75%	35.12%	17.48%	35.91%	30.08%
Wood and related products (NIC 16)	44.16%	46.10%	43.51%	45.45%	41.56%	24.03%	47.40%	39.61%
Paper and related products (NIC 17)	40.63%	40.28%	37.85%	39.93%	42.36%	28.82%	44.44%	44.10%
Printing and reproduction of recorded media (NIC 18)	49.50%	45.54%	37.62%	51.49%	49.50%	27.72%	44.55%	48.51%
Chemicals and chemical products (NIC 20)	46.77%	43.78%	39.86%	47.70%	50.23%	33.41%	51.15%	53.00%
Pharmaceuticals, medicinal chemical and botanical products (NIC 21)	18.15%	20.46%	18.15%	20.85%	25.48%	14.67%	25.87%	22.01%
Rubber and plastics products (NIC 22)	47.45%	47.01%	43.80%	48.47%	51.97%	39.42%	56.35%	63.65%
Other non-metallic mineral products (NIC 23)	13.76%	13.18%	12.31%	13.95%	14.24%	11.43%	18.41%	20.35%
Basic metals (NIC 24)	21.46%	19.86%	20.09%	23.52%	21.00%	10.96%	26.26%	27.40%
Fabricated metal products, except machinery and equipment (NIC 25)	33.09%	35.01%	33.09%	34.53%	36.93%	29.26%	37.89%	39.09%
Computer, Electronic and Electrical Equipment (NIC 26 & 27)	26.33%	28.29%	23.25%	26.61%	31.37%	19.61%	37.54%	40.06%
Machinery and equipment (NIC 28)	42.52%	44.52%	41.53%	43.19%	45.85%	34.55%	45.51%	42.86%
Motor vehicles, trailers and semi-trailers (NIC 29)	17.86%	20.24%	14.88%	17.86%	19.05%	11.90%	20.24%	22.02%
Other and Diversified Manufacturing (NIC 32 & 34)	49.18%	51.91%	48.63%	48.63%	49.73%	43.17%	53.01%	51.91%
Wholesale and retail trade and repair of motor vehicles and motorcycles (NIC 45)	17.86%	17.26%	18.45%	22.62%	16.07%	14.29%	19.64%	38.69%
Wholesale trade, except of motor vehicles and motorcycles (NIC 46)	16.81%	14.66%	17.67%	16.38%	18.53%	13.36%	20.26%	28.02%
All-India % Plus Standard Deviation	42.44%	42.94%	39.51%	43.00%	44.28%	31.15%	46.24%	47.55%
All-India % Minus Standard Deviation	15.82%	16.66%	15.67%	16.70%	17.48%	10.05%	20.26%	22.79%

Best Performers

Above national average + standard deviation

Average Performers

Between national average + standard deviation and national average - standard deviation

Low Performers

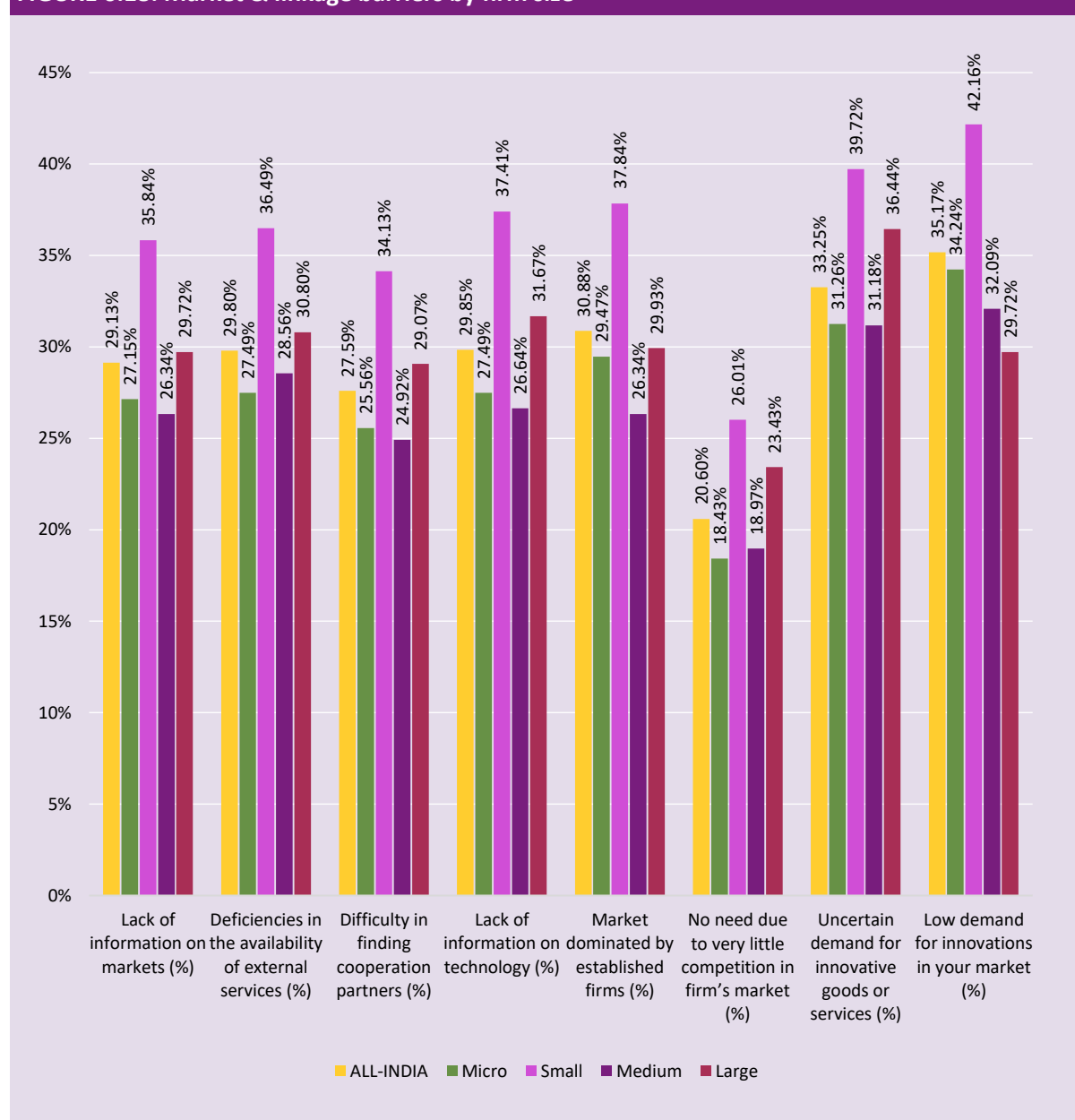
Below national average - standard deviation

6.4.3. MARKET & LINKAGE BARRIERS FACED BY FIRMS: SIZE-WISE

The below graph depicts the % of each indicator reported across all size bins. The data presented indicates that firms of different sizes face varying degrees of challenges in the market. The study highlights that larger firms face a lack of

information on markets and technology, market dominance by established firms, uncertain demand for innovative goods or services, and low demand for innovations in their market. On the other hand, smaller firms face deficiencies in the availability of external services, difficulty in finding cooperation partners, and no need due to very little competition in the firm's market.

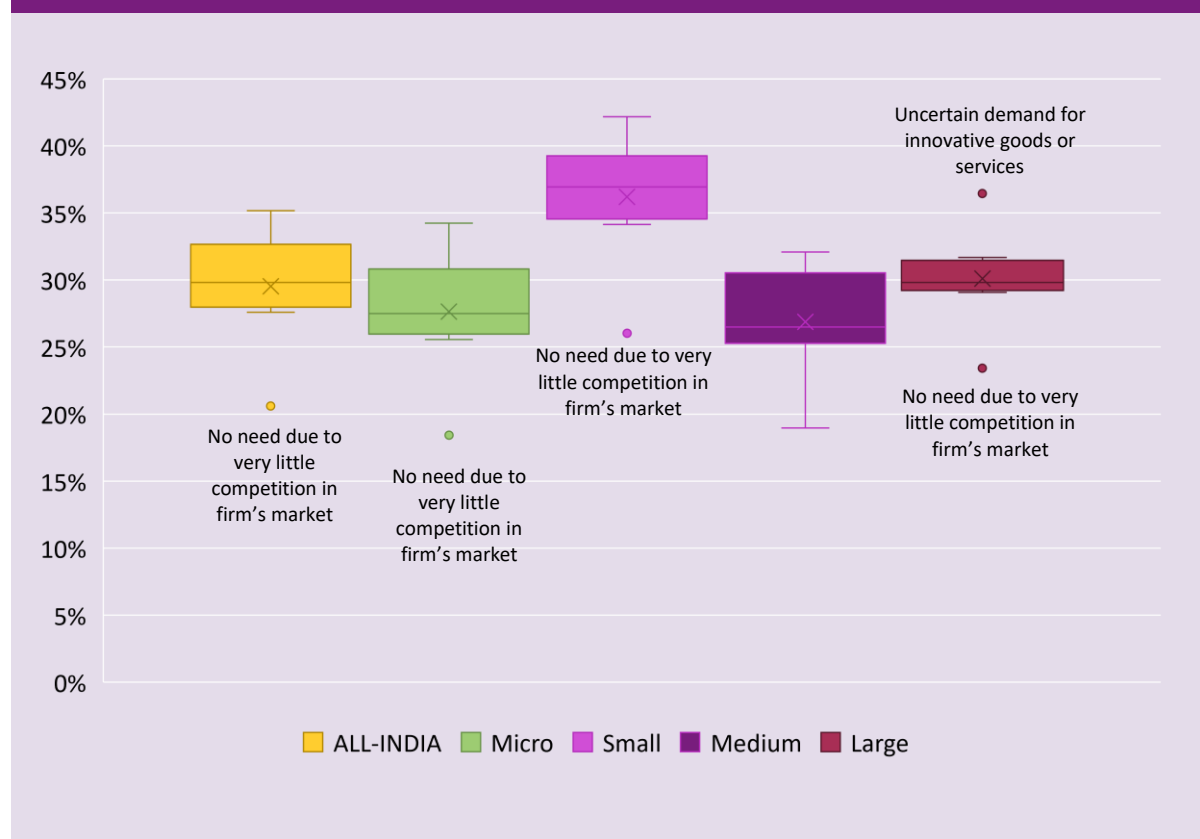
FIGURE 6.18: Market & linkage barriers by firm size



The study's findings suggest that larger firms may have more complex and diverse operations, which require access to a vast amount of market and technological information to stay competitive. They may also face more significant barriers to entry due to established firms' dominance in their markets, which can make it harder for them to introduce innovative products or services.

Smaller firms, on the other hand, may face challenges in accessing external services, such as marketing, legal, or accounting, due to their limited resources. Additionally, they may struggle to find suitable cooperation partners, which can help them to expand their reach and gain access to new markets. However, smaller firms may have an advantage in markets with very little competition, as they may face fewer barriers to entry and have more opportunities to innovate.

FIGURE 6.19: Market and linkage barrier: distribution of firm sizes



No need due to very little competition in the firm's market is a common outlier barrier across all sizes of firms, except in medium firms.

Uncertain demand for innovative goods or services is a common outlier for large-size firms.

A large industrial robotic arm is the central focus, positioned in a factory environment. The background is filled with various industrial structures, including conveyor belts and machinery, all rendered in a blue and purple color scheme. The top right corner features a pattern of white circles on a dark purple background. The overall image has a futuristic and technological feel.

7

**INNOVATION
PERFORMANCE**

INNOVATION PERFORMANCE

Innovation performance is a crucial factor for the growth and competitiveness of the manufacturing and related services sector in India. It is imperative that policymakers, industry stakeholders, and researchers understand the innovation landscape in this sector. The Indian Manufacturing Innovation Index is a useful tool that incorporates innovation performance as one of its three dimensions.

This chapter presents a comprehensive evaluation of the innovation performance of firms operating in the manufacturing and related services sector in India. The analysis is based on the examination of two key pillars: innovation incidence and characteristics, and innovation objectives and outcomes. The evaluation takes into account the objectives that drive firms' innovation input activities, the resulting outputs, including their characteristics such as novelty, and the outcomes of these innovations from both a business and societal perspective.

The primary objective of this chapter is to provide a detailed insight into the innovation landscape in the manufacturing and related services sector in India. This information is intended to support informed decision-making by stakeholders and policymakers, and to contribute to the ongoing conversation about innovation and competitiveness in the country. By conducting a thorough evaluation of the

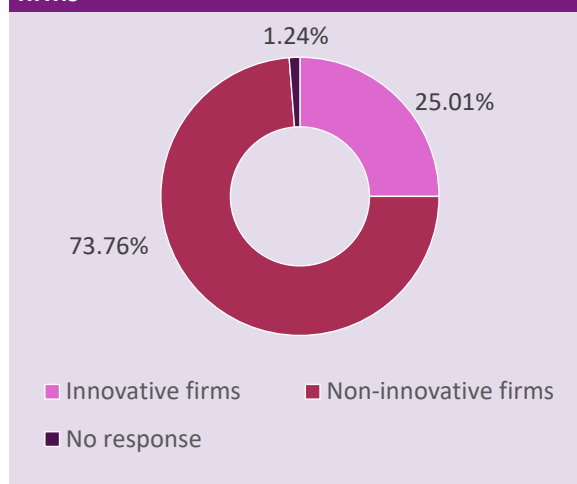
innovation performance of firms in this sector, this chapter aims to provide valuable insights and recommendations that can help enhance innovation and competitiveness in the Indian manufacturing and related services sector.

7.1. INNOVATION INCIDENCE & CHARACTERISTICS

Innovation incidence refers to the occurrence of business innovation in the form of product or business process innovation. In order to be considered an innovative firm, a company must have introduced one or more product or business process innovations within the observation period of the survey, which is from FY 2017-18 to FY 2019-20. Conversely, firms that have not introduced any product or business process innovation during the observation period are categorized as non-innovative firms.

As per the definition provided in Chapter 2, product innovation is a new or improved good or service that significantly differs from the firm's previous offerings and has been introduced in the market. On the other hand, business process innovation (BPI) refers to a new or improved process for one or more business functions that significantly differs from the firm's previous processes and has been implemented by the firm.

FIGURE 7.1: Innovative versus non-innovative firms



The findings, as illustrated in Figure 7.1 concerning the manufacturing and related services sector in India, reveal that 25.01% of the 8,074 firms surveyed are considered innovative during the observation period. This implies that a minority of firms have been successful in implementing new or significantly improved products, processes, marketing strategies, procurement channels, or organizational methods in their business practices, which make them potentially more competitive and adaptable in the market. In contrast, the majority of firms, accounting for 73.76%, did not introduce any product or business process innovation during the observation period.

These results indicate the potential for further innovation and improvement in the sector, as well as the potential benefits for firms that invest in innovation. The non-response rate of 1.24% of firms to the innovation question may indicate a lack of awareness or understanding of what constitutes innovation.

The data presented in this study is a valuable resource for policymakers, industry stakeholders, and researchers in developing policies and strategies that support innovation and improve the competitiveness of firms in the manufacturing and related services sector in India. By highlighting the importance of innovation, the study aims to encourage more firms to invest in innovation and leverage the potential benefits it can offer.

7.1.1. INNOVATION INCIDENCE AND CHARACTERISTICS: STATE-WISE

The findings of the survey on innovation incidence (share of innovative firms and their types) by state and UT are presented in Figure 7.2. Among major states, Telangana, Karnataka, and Tamil Nadu have the highest share of innovative firms at 46.18%, 39.10%, and 31.90%, respectively, while among hill states, Uttarakhand has the highest share of innovators at 30.99%. Dadra & Nagar Haveli & Daman & Diu reported the highest share of innovators at 28.81% among UT and city states.

On the other hand, Odisha, Bihar, and Jharkhand reported the least share of innovators at 12.78%, 13.47%, and 13.71%, respectively, at the all-India level and among major states. Among hill states, North-eastern states (excluding Assam) had the least share of innovators at 19.85%, and Jammu & Kashmir had the least share of innovators at 17.39% among UT and city states.

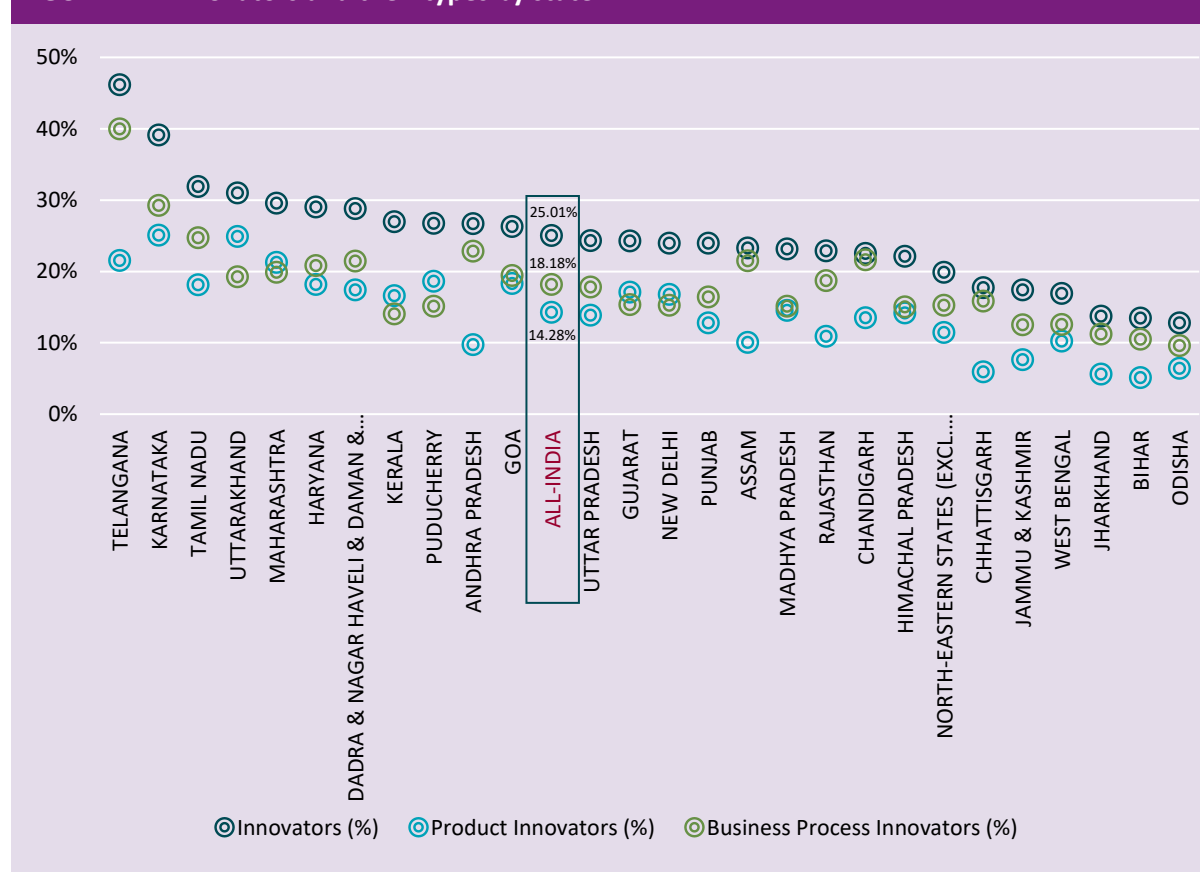
The survey also revealed that the share of firms which introduced business process innovations was higher³⁹ (18.18%) than those firms with

³⁹ either in operations, product or process development, marketing and sales, procurement, logistics and distribution or administration and management

product innovations⁴⁰ (14.28%) at the all-India level and across all states, except for a few states such as Uttarakhand, Maharashtra, Gujarat, Puducherry, New Delhi, and Kerala, where the differences were small (1.39% to 5.63%). The higher share of firms with business process innovation suggests that manufacturing firms in India are more focused on improving their operational efficiency and management practices rather than introducing new products or services. This can lead to cost savings, improved productivity, and ultimately better

performance, which are essential for long-term success. It is also possible that firms are facing a more challenging environment for introducing new products or services due to market saturation or regulatory constraints. By focusing on business process innovation, firms can differentiate themselves and create value in other ways. However, it is important to note that product innovation is also critical for growth and competitiveness, and firms should strive for a balance between the two types of innovation.

FIGURE 7.2: Innovators and their types by state



Product innovators by state

The survey conducted also looked at the share of product innovators across different states and

union territories in India, which refers to firms that introduced one or more new or significantly improved goods or services during the observation period. Figure 7.2 presents the

⁴⁰ either goods or services

results of this analysis. Among all states, Karnataka, Uttarakhand, and Telangana had the highest share of product innovators at 25.07%, 24.88%, and 21.53%, respectively. Karnataka and Telangana had the highest share among major states, while Uttarakhand had the highest share among hill states. In the category of UT and city states, Puducherry and Goa had the highest share of product innovators at 18.60% and 18.29%, respectively.

On the other hand, Bihar, Jharkhand, and Chhattisgarh had the least share of product innovators at 5.09%, 5.61%, and 5.90%, respectively. Among hill states, Assam had the least share of product innovators at 10.05%, while Jammu & Kashmir had the least share among UT and city states at 7.61%. These results suggest that there are significant variations in the share of product innovators across different states and union territories in India, with some states performing better than others.

The findings suggest that some states are performing better than others in terms of introducing new or significantly improved goods or services, indicating that there is potential for further innovation and improvement in the states with a lower share of product innovators. The results also highlight the importance of encouraging and supporting innovation in all states to enhance their competitiveness and adaptability in the market.

Business process innovators by state

The firms that introduced any one or more of the four types of business process innovations, namely, innovations in operations and product or process development, marketing and sales, procurement, logistics and distribution, or

administration and management during the observation period are referred to as business process innovators. The results of the survey on the share of business process innovators across different states and union territories in India are presented in Figure 7.2.

Telangana, Karnataka and Tamil Nadu had the highest share of business process innovators at 39.94%, 29.25% and 24.71%, respectively, among major states. Among hill states, Assam had the largest share of business process innovators at 21.46%. In the category of UT and city states, Chandigarh had the highest share of business process innovators at 21.62%.

On the other hand, Odisha, Bihar and Jharkhand had the least share of business process innovators at 9.58%, 10.48% and 11.21%, respectively, at the all-India level and among major states. Among hill states, Himachal Pradesh had the least share of business process innovators at 15.04%, and Jammu & Kashmir had the least share of business process innovators at 12.50% among UT and city states. These results suggest that there are significant variations in the share of business process innovators across different states and union territories in India, with some states performing better than others.

Innovation incidence and characteristics: states with the highest and least share of firms

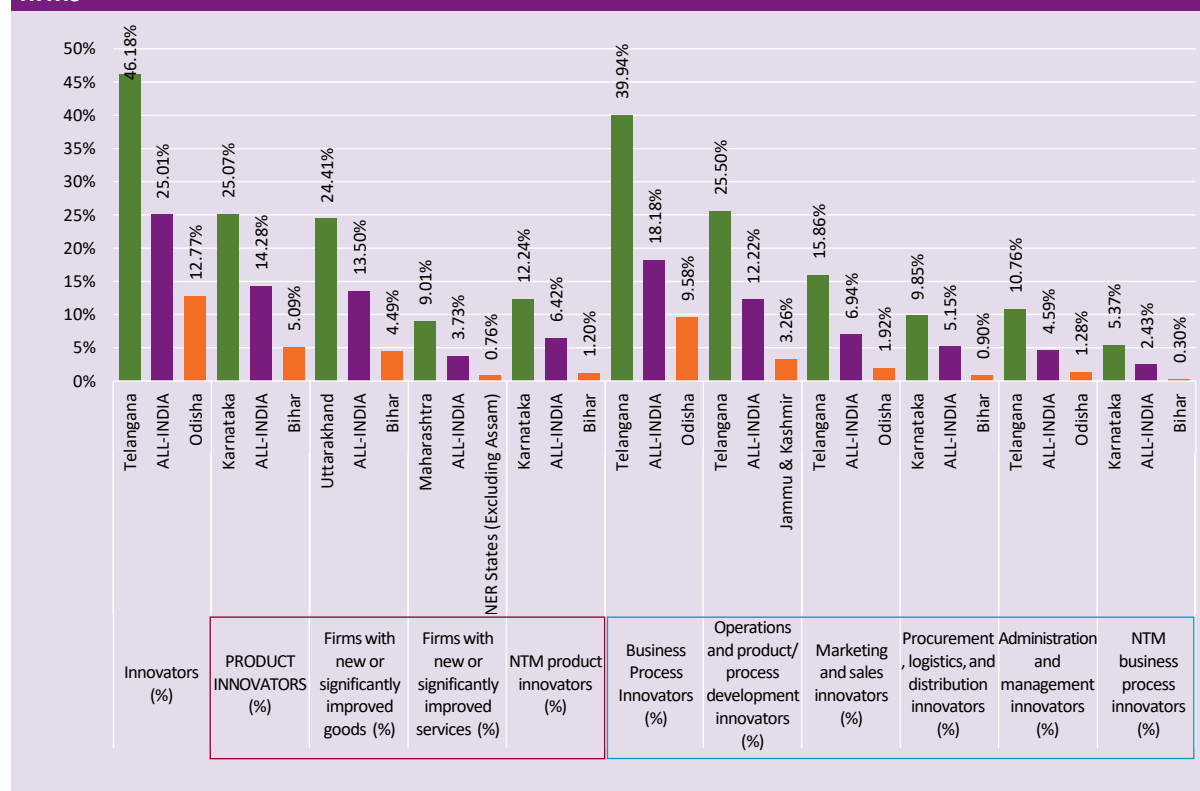
Figure 7.3 presents an overview of the all-India share of firms reporting indicators related to innovation incidence, as well as the states with the highest and least share of such firms. The indicators captured in this analysis explore the type of innovation, including product and business process innovation, their sub-types, and

the novelty of both innovation types. The two sub-types of product innovation are the *introduction of new or significantly improved goods and services*. Business process innovation, on the other hand, encompasses five sub-types, which are innovations in operations and product or process development, marketing and sales, procurement, logistics and distribution, and administration and management.

*Operations and product or process development*⁴¹ cover activities associated with introducing a new, improved, or redesigned product or service to the market, as well as the conversion of inputs

into final outputs, which can be goods or services. *Marketing and sales*⁴², meanwhile, involve marketing techniques such as advertising, direct marketing, exhibitions, market research, and other activities aimed at building new markets. *Procurement, logistics, and distribution* refer to activities related to procuring and storing inputs, as well as storing and delivering final goods to customers. Finally, *administration and management* include activities such as strategic and general business management, cross-functional decision-making, and the organization of work responsibilities.⁴³

FIGURE 7.3: Innovation incidence and characteristics: states with the highest and least share of firms



⁴¹ These include developing business plans, products or services, analysing markets, researching products or services, designing products or services, engineering and technology development, data processing and database development, assembling products, fabricating components, hardware and software maintenance, managing production, producing goods, managing and delivering services, quality assurance or control, technical testing, certification processes, etc.

⁴² Marketing and sales also include pricing techniques and strategies, sales and after-sales activities, including as help desks, other forms of customer assistance, and customer relationship management.

⁴³ Additional activities include corporate governance (legal, planning and public relations); accounting, bookkeeping, auditing, payments, and other financial or insurance activities; human resource management (training and education, staff recruitment, workplace organisation, temporary personnel provision, payroll management, health and medical support); and managing relationships with external stakeholders such as suppliers.

Types of product innovations

According to the NMIS survey, a higher percentage of firms in the manufacturing and related services sector introduced new or significantly improved goods as compared to services. Specifically, 13.50% of firms introduced new or significantly improved goods, whereas only 3.73% introduced new or significantly improved services.

- **New or significantly improved goods**

When looking at the individual states, Uttarakhand had the largest share of firms that introduced new or significantly improved goods at 24.41%, whereas Bihar had the least share of firms that introduced new or significantly improved goods at 4.49%.

- **New or significantly improved services**

Maharashtra reported the largest share of firms introducing new or significantly improved services at 9.0%, while the North-eastern states (excluding Assam) had the least share of firms reporting new or significantly improved services at 0.76%.

Overall, the results suggest that there is still room for improvement in terms of the overall level of innovation and the diversity of innovations across different states in India, despite some states having a higher concentration of firms engaged in product innovation.

- **Novelty of product innovations**

The survey also looked at the novelty of product innovations and found that 6.42% of firms introduced new-to-market product innovations. The share of firms that

introduced only 'new to the firm', 'first in India', 'first in Asia' and 'first in the world' product innovations were relatively low at the national level. Specifically, 12.09%, 2.86%, 0.81% and 0.45% of firms introduced these types of product innovations, respectively. Moreover, out of the firms engaged in product innovation, only 44.62% reported new-to-market innovations.

Karnataka was found to be the top-performing state for new-to-market product innovators, with 12.24% of firms in the state reporting such innovations. Conversely, Bihar was found to be the worst-performing state in this category, with only 1.20% of firms reporting new-to-market product innovations.

Types of business process innovations

The manufacturing and related services firms operating in the state of Telangana have demonstrated noteworthy proficiency in diverse facets of business performance, such as operations and product/process development, marketing and sales, as well as administration and management. These firms have garnered the topmost share in all categories except for procurement, logistics, and distribution, where the firms located in Karnataka have taken the lead. The remarkable performance of the firms in Telangana in various business domains reflects their unwavering commitment towards delivering exceptional value to their customers and achieving operational excellence.

- **Operations and product/process development**

Only 12.22% of firms at the national level were involved in innovations related to operations and product/process

development. However, the state of Telangana stood out with the highest share of firms engaging in such innovations, accounting for 25.50% of the total. In contrast, Jammu & Kashmir had the lowest share of firms at 3.26%.

- **Marketing and sales**

The survey also revealed that the all-India share of firms engaged in marketing and sales innovations was 6.94%. However, Telangana surpassed this figure with the highest share of firms, accounting for 15.86%. Conversely, Odisha had the least share of firms at 1.92%.

- **Procurement, logistics, and distribution**

In terms of innovations in procurement, logistics, and distribution, the firms in Karnataka showcased exceptional performance, recording a share of 9.85% compared to the all-India share of 5.15%. Bihar, on the other hand, had the lowest share of firms at 0.90%.

- **Administration and management**

The survey also analysed the prevalence of innovations in administration and management among firms. At the national level, only 4.59% of firms reported such innovations. Telangana had the highest share of firms in this category, accounting for 10.76% of the total. Meanwhile, Odisha had the least share of firms at 1.28%.

- **Novelty of business process innovations**

Out of all the firms surveyed, only 2.43% reported engaging in new-to-market (NTM) business process innovations. However, 10.00% of firms reported introducing "only

new to your firm BPI". Moreover, 1.13% of firms introduced "first in India" business process innovations, while 0.30% and 0.16% of firms introduced "first in Asia" and "first in the world" business process innovations, respectively. At the national level, out of the 18.18% of firms engaged in business process innovations (BPI), only 2.43% introduced NTM BPI, with Karnataka having the highest share of 5.37% and Bihar the lowest share at 0.30%.

It should also be noted that the survey found both the share of new-to-market business process innovators (2.43%) and the share of new-to-market product innovators (6.42%) to be relatively low.

Innovation incidence and characteristics: the best, average and lowest performers among states

Table 7.1 provides a comprehensive classification of states and union territories in India, based on their respective shares of firms that reported indicators under the innovation incidence and characteristics pillar. This pillar encompasses a variety of indicators, including the share of innovators, product innovators and their sub-types, new-to-market product innovators, business process innovators and their sub-types, and new-to-market business process innovators.

The states and union territories have been divided into three categories, namely, best performers, average performers and low performers, based on their respective shares of firms, namely, those with the best, average, and lowest share of firms. For each indicator, the table identifies the states with the highest, average, and lowest share of firms.

The states of Telangana, Karnataka, and Maharashtra stand out as having the highest share of firms across most of the indicators. Furthermore, among all the indicators, procurement, logistics, and distribution had the highest number of best performing states (7).

The table's best performer category includes states with a higher share of firms reporting under a particular indicator than the all-India share *plus* the standard deviation of that indicator. In contrast, the low performer category includes states with a share of firms reporting under an indicator lower than the all-India share *minus* the standard deviation of that indicator. The average performer category represents states with the share of firms reporting under a specific indicator falling within the all-India share *plus* standard deviation and the all-India share *minus* the standard deviation.

- **Innovators: best and low performers among states**

Among the share of innovators, Telangana (46.18%) and Karnataka (39.10%) had the highest shares of manufacturers and related services firms. In contrast, Odisha (12.78%), Bihar (13.47%), Jharkhand (13.71%), Jammu & Kashmir (17.39%), and West Bengal (16.91%) had the lowest shares.

- **Product innovators: best and low performers among states**

When it comes to product innovation, Karnataka (25.07%), Uttarakhand (24.88%), Telangana (21.53%), and Maharashtra (21.25%) were the top performers, while Bihar (5.09%), Jharkhand (5.61%), Chhattisgarh (5.90%), Odisha (6.39%), and

Jammu and Kashmir (7.61%) had the lowest shares.

- **New or significantly improved goods: best and low performers among states**

Furthermore, Uttarakhand (24.41%), Karnataka (23.58%), Telangana (20.11%), and Maharashtra (19.17%) were the states with the highest shares of firms introducing new or significantly improved goods. On the other hand, Bihar (4.49%), Jharkhand (5.30%), Chhattisgarh (5.59%), Odisha (6.07%), and Jammu and Kashmir (7.61%) had the lowest shares of such firms.

- **New or significantly improved services: best and low performers among states**

In terms of services innovation, Maharashtra (9.01%), Karnataka (8.36%), Goa (6.86%), and New Delhi (6.59%) reported the highest shares of firms introducing new or significantly improved services. Conversely, North-eastern States (excluding Assam) (0.76%), Bihar (0.90%), and Odisha (0.96%) had the lowest shares.

- **New-to-market (NTM) product innovators: best and low performers among states**

Among new-to-market (NTM) product innovators, Karnataka (12.24%), Uttarakhand (10.33%), Maharashtra (9.70%), and Haryana (9.68%) reported the best share whereas the lowest shares were reported by Bihar (1.20%), Chhattisgarh (1.86%), Andhra Pradesh (2.56%), Assam (2.74%), and Jharkhand (2.80%).

- **Business process innovators: best and low performers among states**

In the category of business process innovators, Telangana, Karnataka, and Tamil Nadu emerged as the best performers, reporting the highest shares of innovators at 39.94%, 29.25%, and 24.71%, respectively. In contrast, Odisha, Bihar, and Jharkhand had the lowest shares of business process innovators at 9.58%, 10.48%, and 11.21%, respectively.

- **Innovators in operations and product/process development: best and low performers among states**

In terms of innovators in operations and product/process development, Telangana (25.50%), Karnataka (18.51%), Tamil Nadu (17.82%), and Andhra Pradesh (16.92%) had the highest shares, while Jammu & Kashmir (3.26%), Odisha (6.39%), Bihar (7.19%), Kerala (7.38%), and Jharkhand (7.48%) reported the lowest shares.

- **Innovators in marketing and sales: best and low performers among states**

Similarly, Telangana (15.86%), Chandigarh (12.61%), Karnataka (11.34%), and Maharashtra (10.85%) reported the best shares of firms involved in innovations in marketing and sales, whereas Odisha (1.92%) and Jharkhand (2.80%) had the lowest shares across all states.

- **Innovators in procurement, logistics, and distribution: best and low performers among states**

Regarding innovations in procurement, logistics, and distribution, Karnataka

(9.85%), Dadra & Nagar Haveli & Daman & Diu (8.33%), Telangana (8.22%), Chandigarh (8.11%), Tamil Nadu (8.05%), Assam (7.76%), and Maharashtra (7.62%) had the highest shares, while Bihar (0.90%), Odisha (1.60%), and Jammu & Kashmir (2.17%) reported the lowest shares.

- **Innovators in administration and management: best and low performers among states**

Innovators in administration and management were most prevalent in Telangana (10.76%), Karnataka (8.36%), and Chandigarh (8.11%), whereas Odisha (1.28%), Chhattisgarh (1.86%), and Jharkhand (2.49%) reported the lowest shares.

- **New-to-market (NTM) business process innovators: best and low performers among states**

Furthermore, the analysis revealed that Karnataka (5.73%), Himachal Pradesh (4.42%), Uttarakhand (4.23%), Maharashtra (4.16%), and Tamil Nadu (3.74%) had the highest shares of new-to-market (NTM) business process innovators, while Bihar (0.30%), Jammu & Kashmir (0.54%), Rajasthan (0.78%), Andhra Pradesh (1.03%), and Kerala (1.11%) had the lowest shares.

It is worth noting that the rest of the states reported average shares of firms concerning the national share and standard deviation for each of the indicators under the innovation incidence and characteristics pillar, as mentioned in Table 7.1.

TABLE 7.1: Innovation incidence and characteristics: the best, average and lowest performers among states

States	Innovators (%)	Product Innovators (%)	Share of firms with new or significantly improved goods	Share of firms with new or significantly improved services	Share of new-to-market (NTM) product innovators	Business Process Innovators (%)	Share of firms into innovations in operations and product/process development	Share of firms into innovations in marketing and Sales	Share of firms into innovations in procurement, logistics, and distribution	Share of firms into innovations in administration and management	NTM business process innovators
All-India	25.01%	14.28%	13.50%	3.73%	6.42%	18.18%	12.22%	6.94%	5.15%	4.59%	2.43%
MAJOR STATES											
Andhra Pradesh	26.67%	9.74%	9.23%	2.05%	2.56%	22.82%	16.92%	6.67%	3.59%	3.59%	1.03%
Bihar	13.47%	5.09%	4.49%	0.90%	1.20%	10.48%	7.19%	4.49%	0.90%	3.29%	0.30%
Chhattisgarh	17.70%	5.90%	5.59%	1.86%	1.86%	15.84%	9.01%	4.97%	3.42%	1.86%	2.17%
Gujarat	24.26%	17.08%	16.34%	3.47%	8.17%	15.35%	9.16%	7.43%	4.95%	2.97%	1.98%
Haryana	29.03%	18.18%	16.42%	2.64%	9.68%	20.82%	16.13%	6.16%	5.87%	5.28%	3.52%
Jharkhand	13.71%	5.61%	5.30%	1.56%	2.80%	11.21%	7.48%	2.80%	3.12%	2.49%	1.87%
Karnataka	39.10%	25.07%	23.58%	8.36%	12.24%	29.25%	18.51%	11.34%	9.85%	8.36%	5.37%
Kerala	26.94%	16.61%	15.87%	4.06%	7.38%	14.02%	7.38%	5.17%	5.17%	4.06%	1.11%
Madhya Pradesh	23.15%	14.54%	13.95%	4.45%	4.75%	15.13%	10.09%	4.45%	4.75%	4.15%	1.19%
Maharashtra	29.56%	21.25%	19.17%	9.01%	9.70%	19.86%	12.24%	10.85%	7.62%	5.77%	4.16%
Odisha	12.78%	6.39%	6.07%	0.96%	3.51%	9.58%	6.39%	1.92%	1.60%	1.28%	1.28%
Punjab	23.93%	12.79%	12.79%	2.62%	5.25%	16.39%	13.11%	4.92%	2.95%	3.28%	2.30%
Rajasthan	22.86%	10.91%	9.35%	3.12%	4.68%	18.70%	12.73%	6.23%	3.38%	5.19%	0.78%
Tamil Nadu	31.90%	18.10%	17.24%	4.02%	9.20%	24.71%	17.82%	6.32%	8.05%	4.89%	3.74%
Telangana	46.18%	21.53%	20.11%	5.95%	7.65%	39.94%	25.50%	15.86%	8.22%	10.76%	3.12%
Uttar Pradesh	24.29%	13.84%	13.56%	3.39%	5.93%	17.80%	11.30%	6.21%	4.52%	3.39%	1.98%
West Bengal	16.91%	10.20%	9.91%	1.75%	6.41%	12.54%	9.04%	5.25%	4.08%	4.37%	3.50%
HILL STATES											
Assam	23.29%	10.05%	9.59%	2.28%	2.74%	21.46%	15.53%	6.85%	7.76%	4.11%	2.28%
Himachal Pradesh	22.12%	14.16%	14.16%	2.21%	9.29%	15.04%	12.39%	3.98%	4.87%	2.65%	4.42%
North-Eastern States (Exc. Assam)	19.85%	11.45%	11.45%	0.76%	3.82%	15.27%	11.45%	6.11%	3.82%	5.34%	1.53%
Uttarakhand	30.99%	24.88%	24.41%	5.63%	10.33%	19.25%	15.02%	8.92%	4.69%	3.76%	4.23%
UT AND CITY STATES											
Chandigarh	22.52%	13.51%	13.51%	5.41%	6.31%	21.62%	10.81%	12.61%	8.11%	8.11%	2.70%
Dadra & Nagar Haveli & Daman & Diu	28.81%	17.38%	16.67%	3.10%	9.05%	21.43%	11.90%	9.05%	8.33%	6.19%	3.10%
Goa	26.29%	18.29%	15.43%	6.86%	6.29%	19.43%	14.29%	8.57%	5.14%	4.57%	1.71%
Jammu & Kashmir	17.39%	7.61%	7.61%	1.63%	4.35%	12.50%	3.26%	6.52%	2.17%	5.98%	0.54%
New Delhi	23.95%	16.77%	14.37%	6.59%	9.28%	15.27%	9.28%	7.19%	6.29%	5.39%	2.69%
Puducherry	26.74%	18.60%	16.86%	4.65%	4.65%	15.12%	10.47%	6.98%	4.07%	3.49%	1.74%
All-India % plus standard deviation	32.43%	19.96%	18.79%	5.98%	9.37%	24.48%	16.79%	9.97%	7.43%	6.65%	3.73%
All-India % minus standard deviation	17.59%	8.60%	8.21%	1.48%	3.47%	11.88%	7.65%	3.91%	2.87%	2.53%	1.13%

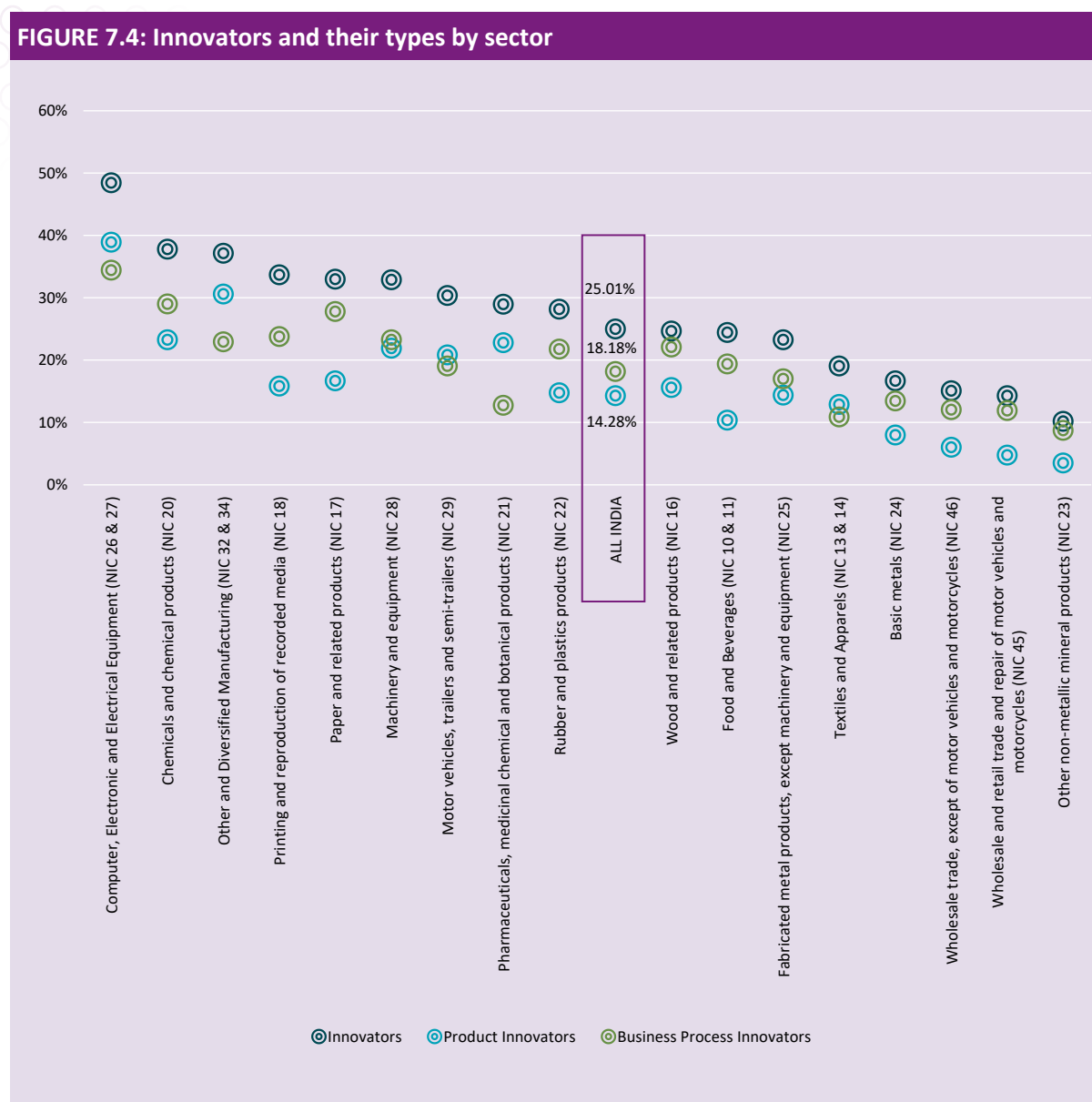
Best Performers
Above national average + standard deviation

Average Performers
Between national average + standard deviation and national average - standard deviation

Low Performers
Below national average - standard deviation

7.1.2. INNOVATION INCIDENCE AND CHARACTERISTICS: SECTOR-WISE

Figure 7.4 presents the findings of the survey with a focus on the share of innovative firms and their types at the all-India level and across different sectors⁴⁴.



Innovators by sector

The findings in Figure 7.4 reveal that, among the sectors in manufacturing and related services in India, the computer, electronic, and electrical

equipment sector has the largest share of innovators at 48.46%, followed by the chemical sector at 37.79%, and the other diversified manufacturing sector at 37.16%. The sectors with the lowest share of innovators are other

⁴⁴ As mentioned in the methodology, the analysis of innovation performance at the sector level is limited to 17 sectors (grouped from the 58 NIC sectors) that had a minimum of 100 responses.

non-metallic mineral products at 10.17%, wholesale and retail trade and repair of motor vehicles and motorcycles at 14.29%, and wholesale trade excluding motor vehicles and motorcycles at 15.09%. These results suggest that technology-focused sectors and those that manufacture goods are leading the innovation landscape in India, while the retail, trade, and service sectors lag behind.

Similar to the state-level analysis, the results indicate that a majority of sectors (12 out of 17) have a higher share of business process innovators than product innovators, indicating that a larger share of firms in these sectors is focused on improving their internal processes and operations. However, there are a few exceptions, such as the computer, electronic, and electrical equipment, other and diversified manufacturing, motor vehicles, trailers and semi-trailers, pharmaceuticals, medicinal chemical, and botanical products, and textiles and apparel sectors which are more focused on product innovations.

- **Product innovators by sector**

The results of the survey show that the computer, electronic, and electrical equipment sector (38.94%) has the highest share of product innovators across all sectors in India, followed by other and diversified manufacturing (30.60%) and

chemicals (23.27%) sectors. Conversely, the least share of firms involved in product innovations are engaged in other non-metallic mineral products (3.49%), wholesale and retail trade and repair of motor vehicles and motorcycles (4.76%), and wholesale trade, except of motor vehicles and motorcycles (6.03%).

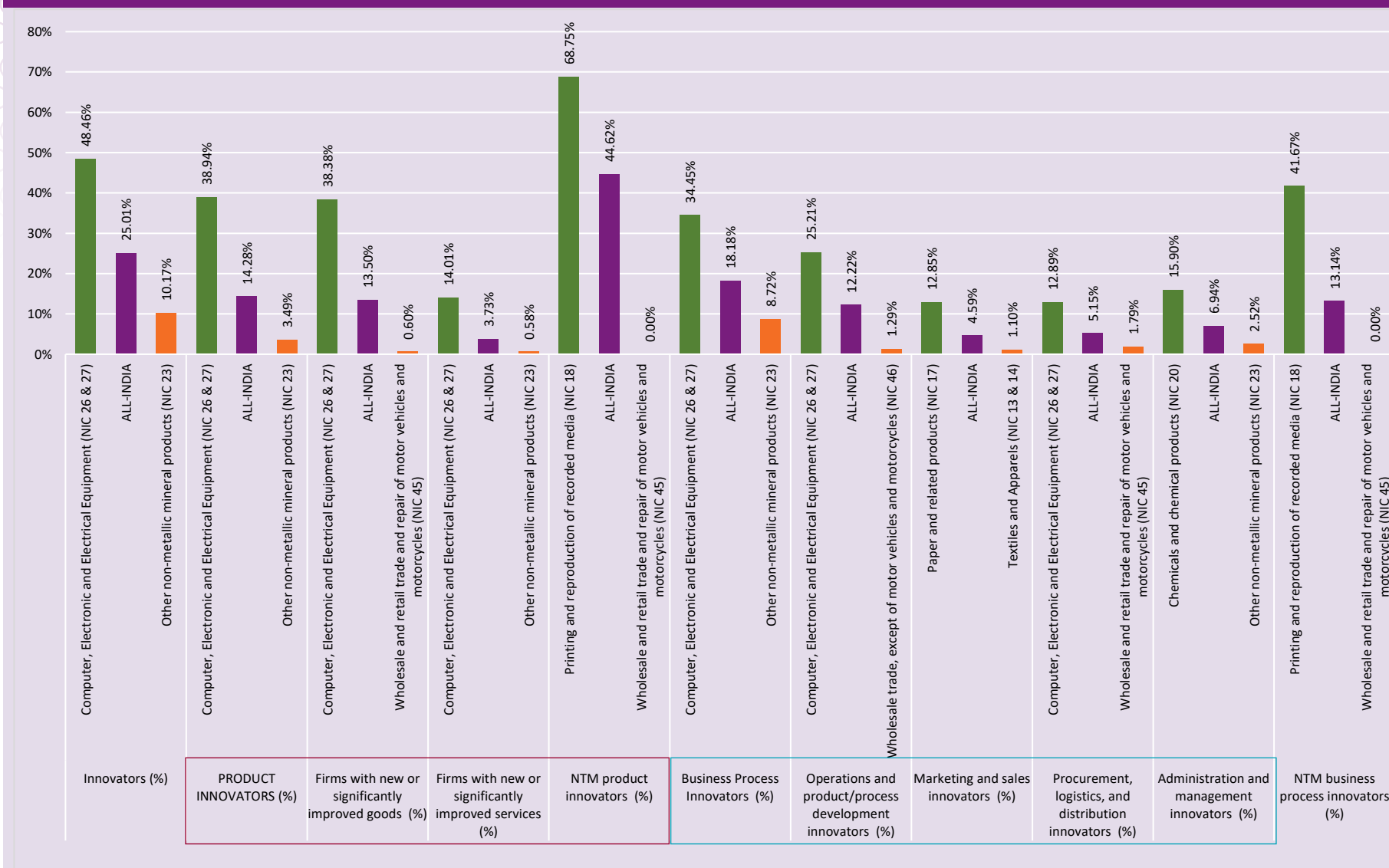
- **Business process innovators by sector**

Regarding business process innovators (BPI), the computer, electronic, and electrical equipment sector (34.45%) had the highest share of firms introducing BPI at the national level, followed by the chemicals and chemical products (29.03%) and paper and related products (27.78%) sectors. However, the sectors with the least share of business process innovators are in other non-metallic mineral products (8.72%), textiles and apparel (10.87%), and wholesale and retail trade and repair of motor vehicles and motorcycles (11.90%).

Innovation incidence and characteristics: top and least performing sectors

Figure 7.5 provides an overview of the all-India share and the states with the highest and least share of firms reporting indicators related to innovation incidence and characteristics.

FIGURE 7.5: Innovation incidence & characteristics: sectors with the highest and least share of firms



Types of product innovations

- **New or significantly improved goods**

New or significantly improved goods were introduced by 13.50% of firms at the national level, with the computer, electronic and electrical equipment sector having the largest share of firms at 38.38%. Meanwhile, the wholesale and retail trade and repair of motor vehicles and motorcycles had the least share of firms at 0.60%.

- **New or significantly improved services**

Additionally, 3.73% of firms at the national level introduced new or significantly improved services, with the computer, electronic and electrical equipment sector having the largest share of firms at 14.01%, while the non-metallic mineral products sector had the least share at 0.58%.

- **Novelty of product innovations**

Moreover, the survey revealed that 6.42% of firms reported new-to-market product innovations, with the computer, electronic and electrical equipment sector leading at 19.05%. On the other hand, wholesale and retail trade and repair of motor vehicles and motorcycles had no firms reporting new-to-market product innovations.

Types of business process innovations

- **Operations and product/process development**

Specifically, 12.22% of firms were engaged in innovations in operations and product/process development at the national level, with the computer, electronic and electrical equipment sector having the highest share of firms at 25.21%, while wholesale trade, except

for the motor vehicles and motorcycles sector, reported the least share of firms at 1.29%.

- **Marketing and sales**

Furthermore, 6.94% of firms at the national level reported innovations in marketing and sales, with the highest share of firms in chemicals and chemical products at 15.90% and the least share in textiles and apparels at 2.52%.

- **Procurement, logistics, and distribution**

Additionally, the computer, electronic and electrical equipment sector had the highest share of firms reporting procurement, logistics, and distribution innovations at 12.89%, while the all-India share was 5.15%. In contrast, wholesale and retail trade and repair of motor vehicles and motorcycles had the least share at 1.79%.

- **Administration and management**

4.59% of firms at the national level reported innovations in administration and management. The paper and related products sector reported the highest share of firms introducing innovations in this aspect, with 12.85%. In contrast, the textiles and apparel sector had the least share of firms introducing innovations in administration and management, with only 1.10%.

- **Novelty of business process innovations**

Only 2.43% of firms at the national level introduced new-to-market business process innovators, with printing and reproduction of recorded media having the highest share of NTM BPI at 9.90%, while wholesale and retail trade and repair of motor vehicles and motorcycles had no firms reporting the indicator.

Innovation incidence and characteristics: the best, average and low performers among sectors

Table 7.2 provides a categorization of various sectors into three categories, based on the share of firms reporting indicators under the innovation incidence and characteristics pillar. The indicators covered include the share of innovators, product innovators and its subtypes, new-to-market product innovators, business process innovators and its subtypes, and new-to-market business process innovators.

Manufacturing and related services firms in the computer, electronic, and electrical equipment sector, other and diversified manufacturing, and chemicals sectors led across most indicators. In particular, manufacturing and related services firms in the computer, electronic, and electrical equipment sector emerged as the best performing sector across all the indicators under innovation incidence and characteristics, except for new-to-market product, new-to-market business process innovation, as well as innovations in administration and management and marketing and sales.

On the other hand, the other non-metallic mineral products sector, the wholesale and retail trade and repair of motor vehicles and motorcycles sector, and the wholesale trade, excluding motor vehicles and motorcycles sector had the lowest share of firms reporting across most indicators. However, it is noteworthy that despite being an average performer across most indicators, the printing and reproduction of recorded media sector demonstrated exceptional performance in the realm of new-to-market products and new-to-market business process innovations.

- **Innovators: best and low performers among sectors**

The share of innovators was highest in computer, electronic and electrical equipment (48.46%), chemicals and chemical products (37.79%), and other and diversified manufacturing (37.16%) sectors. In contrast, non-metallic mineral products (10.17%) and wholesale and retail trade and repair of motor vehicles and motorcycles (14.29%) had the lowest share of innovators.

- **Product innovators: best and low performers among sectors**

Computer, electronic and electrical equipment (38.94%) and other and diversified manufacturing (30.60%) sectors had the best share of manufacturing and related services firms with product innovation. Other non-metallic mineral products (3.49%) and wholesale and retail trade and repair of motor vehicles and motorcycles (4.76%) had the lowest share of product innovators.

- **New or significantly improved goods: best and low performers among sectors**

Computer, electronic and electrical equipment (38.38%) and other diversified manufacturing (28.96%) sectors had the best share of manufacturing and related services firms with new or significantly improved goods. Wholesale and retail trade and repair of motor vehicles and motorcycles (0.60%) and other non-metallic mineral products (3.29%) had the lowest share of new or significantly improved goods.

- **New or significantly improved services: best and low performers among sectors**

Computer, electronic and electrical equipment (14.01%), other and diversified manufacturing (10.93%), and pharmaceuticals, medicinal, chemical, and botanical products (8.49%) had the best share of manufacturing and related services firms with new or significantly improved services. No sectors fall in the low performer category for this indicator.

- **New-to-market product innovators: best and low performers among sectors**

Among the share of new-to-market (NTM) product innovators, computer, electronic and electrical equipment (19.05%), other and diversified manufacturing (15.85%), and chemicals and chemical products (11.98%) had the highest share of manufacturing and related services firms. Wholesale and retail trade and repair of motor vehicles and motorcycles (0.00%) is the low performer for NTM product innovations.

- **Business process innovators: best and low performers among sectors**

Regarding business process innovators, computer, electronic and electrical equipment (34.45%), chemicals and chemical products (29.03%), and paper and related products (27.78%) sectors had the highest share of manufacturing and related services firms, while other non-metallic mineral products (8.72%) and textiles and apparels (10.87%) had the lowest share.

- **Innovations in operations and product/process development: best and low performers among sectors**

Concerning innovations in operations and product/process development, computer, electronic and electrical equipment (25.21%), other diversified manufacturing (19.67%), paper and related products (19.10%), and printing and reproduction of recorded media (18.81%) sectors had the highest share of manufacturing and related services firms, while wholesale trade, except motor vehicles and motorcycles (1.29%), wholesale and retail trade and repair of motor vehicles and motorcycles (3.57%), and other non-metallic mineral products (5.81%) had the lowest share of firms.

- **Innovations in marketing and sales: best and low performers among sectors**

Among the share of firms into innovations in marketing and sales, chemicals and chemical products (15.90%), paper and related products (13.19%), and computer, electronic and electrical equipment (13.17%), rubber and plastics products (10.07%), other and diversified manufacturing (9.84%), wood and related products (9.74%), and wholesale and retail trade and repair of motor vehicles and motorcycles (8.93%) had the highest share of manufacturing and related services firms, while no sectors were low performers.

- **Innovations in procurement, logistics, and distribution: best and low performers among sectors**

Concerning innovations in procurement, logistics, and distribution, computer, electronic and electrical equipment (12.89%), chemicals and chemical products (9.68%), and machinery and equipment (9.30%) sectors had the highest share of manufacturing and related services firms, while wholesale and retail trade and repair of motor vehicles and motorcycles (1.79%) had the lowest share of firms.

- **Innovations in administration and management: best and low performers among sectors**

Among the firms engaging in innovations in administration and management, the paper and related products sector had the highest share (12.85%), followed closely by the wood and related products sector with a share of

12.34%. In contrast, the textiles and apparel sector had the lowest share of firms (1.10%), followed by other non-metallic mineral products (1.36%), basic metals (1.83%), pharmaceuticals, medicinal chemical and botanical products (2.32%), wholesale and retail trade and repair of motor vehicles and motorcycles (2.38%), and motor vehicles, trailers and semi-trailers (2.98%).

- **New-to-market business process innovators: best and low performers among sectors**

Regarding new-to-market (NTM) business process innovators, printing and reproduction of recorded media had the highest share of firms (9.90%), followed by other and diversified manufacturing (6.56%), and computer, electronic and electrical equipment (5.32%). However, there were no low performers in for this indicator.

Rest of the sectors were average performers for all the indicators mentioned in Table 7.2.

TABLE 7.2: Innovation incidence and characteristics: the best, average and lowest performers among sectors

Sectors	Innovators	Product Innovation	Share Of Firms with New or Significantly Improved Goods	Share Of Firms with New or Significantly Improved Services	Share Of New-To-Market (NTM) Product Innovators	Business Process Innovation	Share of firms into innovations in operations and product/process development	Share of firms into innovations in administration and management	Share of firms into innovations in procurement, logistics, and distribution	Share of firms into innovations in marketing and Sales	NTM business process innovators
All-India	25.01%	14.28%	13.50%	3.73%	6.42%	18.18%	12.22%	4.59%	5.15%	6.94%	2.43%
Food and Beverages (NIC 10 & 11)	24.43%	10.39%	10.19%	1.46%	3.00%	19.37%	13.85%	5.46%	3.26%	3.73%	1.00%
Textiles and Apparels (NIC 13 & 14)	19.06%	12.91%	12.60%	2.68%	6.46%	10.87%	7.87%	2.52%	2.83%	1.10%	1.57%
Wood and related products (NIC 16)	24.68%	15.58%	14.94%	1.30%	5.19%	22.08%	16.88%	9.74%	4.55%	12.34%	1.95%
Paper and related products (NIC 17)	32.99%	16.67%	16.32%	4.51%	6.60%	27.78%	19.10%	13.19%	7.64%	12.85%	3.13%
Printing and reproduction of recorded media (NIC 18)	33.66%	15.84%	13.86%	5.94%	10.89%	23.76%	18.81%	3.96%	1.98%	3.96%	9.90%
Chemicals and chemical products (NIC 20)	37.79%	23.27%	22.35%	3.46%	11.98%	29.03%	16.59%	15.90%	9.68%	8.29%	3.23%
Pharmaceuticals, medicinal chemical, and botanical products (NIC 21)	28.96%	22.78%	22.78%	8.49%	9.27%	12.74%	8.49%	3.86%	4.25%	2.32%	3.86%
Rubber and plastics products (NIC 22)	28.18%	14.74%	14.45%	1.75%	7.15%	21.75%	11.97%	10.07%	7.01%	5.26%	2.77%
Other non-metallic mineral products (NIC 23)	10.17%	3.49%	3.29%	0.58%	1.36%	8.72%	5.81%	2.52%	3.10%	1.36%	0.48%
Basic metals (NIC 24)	16.67%	7.99%	7.99%	2.28%	3.20%	13.47%	9.36%	3.65%	3.42%	1.83%	2.51%
Fabricated metal products, except machinery and equipment (NIC 25)	23.26%	14.39%	13.67%	3.36%	4.32%	17.03%	12.47%	4.32%	5.04%	3.84%	1.20%
Computer, Electronic and Electrical Equipment (NIC 26 & 27)	48.46%	38.94%	38.38%	14.01%	19.05%	34.45%	25.21%	13.17%	12.89%	8.12%	5.32%
Machinery and equipment (NIC 28)	32.89%	21.93%	21.93%	2.99%	8.97%	23.26%	11.63%	8.64%	9.30%	5.98%	2.99%
Motor vehicles, trailers, and semi-trailers (NIC 29)	30.36%	20.83%	19.64%	4.17%	10.71%	19.05%	16.07%	4.76%	2.38%	2.98%	4.17%
Other and Diversified Manufacturing (NIC 32 & 34)	37.16%	30.60%	28.96%	10.93%	15.85%	22.95%	19.67%	9.84%	8.20%	7.10%	6.56%
Wholesale and retail trade and repair of motor vehicles and motorcycles (NIC 45)	14.29%	4.76%	0.60%	4.17%	0.00%	11.90%	3.57%	8.93%	1.79%	2.38%	0.00%
Wholesale trade, except of motor vehicles and motorcycles (NIC 46)	15.09%	6.03%	4.31%	2.16%	2.59%	12.07%	1.29%	8.19%	4.74%	6.90%	0.43%
All-India % plus standard deviation	34.99%	23.58%	23.05%	7.36%	11.57%	25.39%	18.56%	8.68%	8.33%	10.51%	4.49%
All-India % minus standard deviation	15.03%	4.98%	3.95%	0.10%	1.27%	10.97%	5.88%	0.50%	1.97%	3.37%	-0.08%

Best Performers

Above national average + standard deviation

Average Performers

Between national average + standard deviation and national average - standard deviation

Low Performers

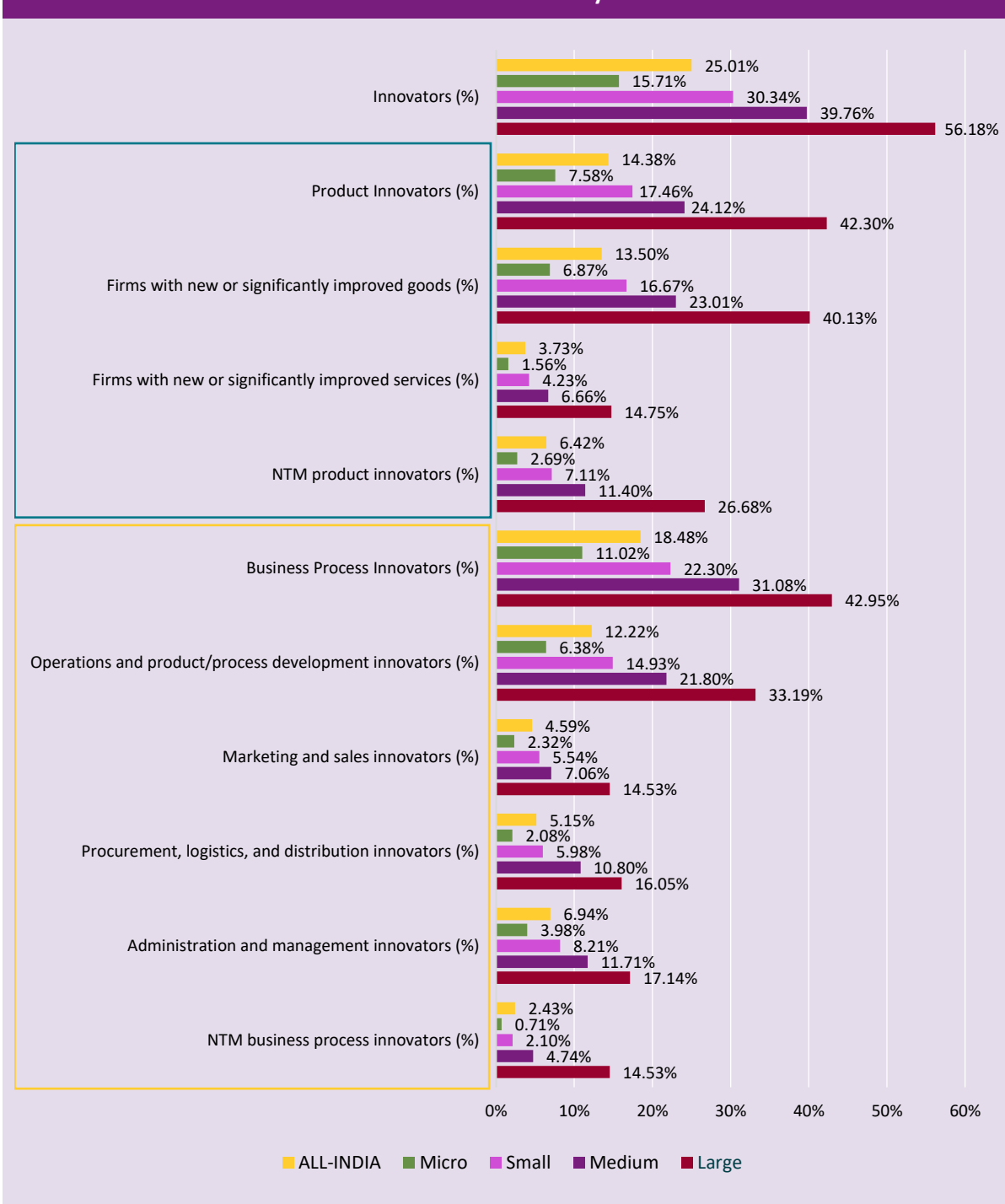
Below national average - standard deviation

7.1.3. INNOVATION INCIDENCE AND CHARACTERISTICS: SIZE-WISE

The survey reveals that less than half of the firms surveyed were innovators across all firm sizes except for large firms (56.18%). The share of

large firms that introduced product innovations (42.30%) was almost equal to that of business process innovations (42.95%), unlike at the all-India level and for other firm sizes, where the share of business process innovations was relatively higher than product innovators.

FIGURE 7.6: Incidence and characteristics of innovation by firm size



Further, the data indicates that the share of firms introducing new or significantly improved goods was higher than those introducing new or significantly improved services across all firm sizes within product innovation. In terms of business process innovation, the most common innovation across firm sizes was in operations and product or process development. However, the least common innovation was in procurement, logistics, and distribution for micro firms, and in administration and management for small, medium, and large firms.

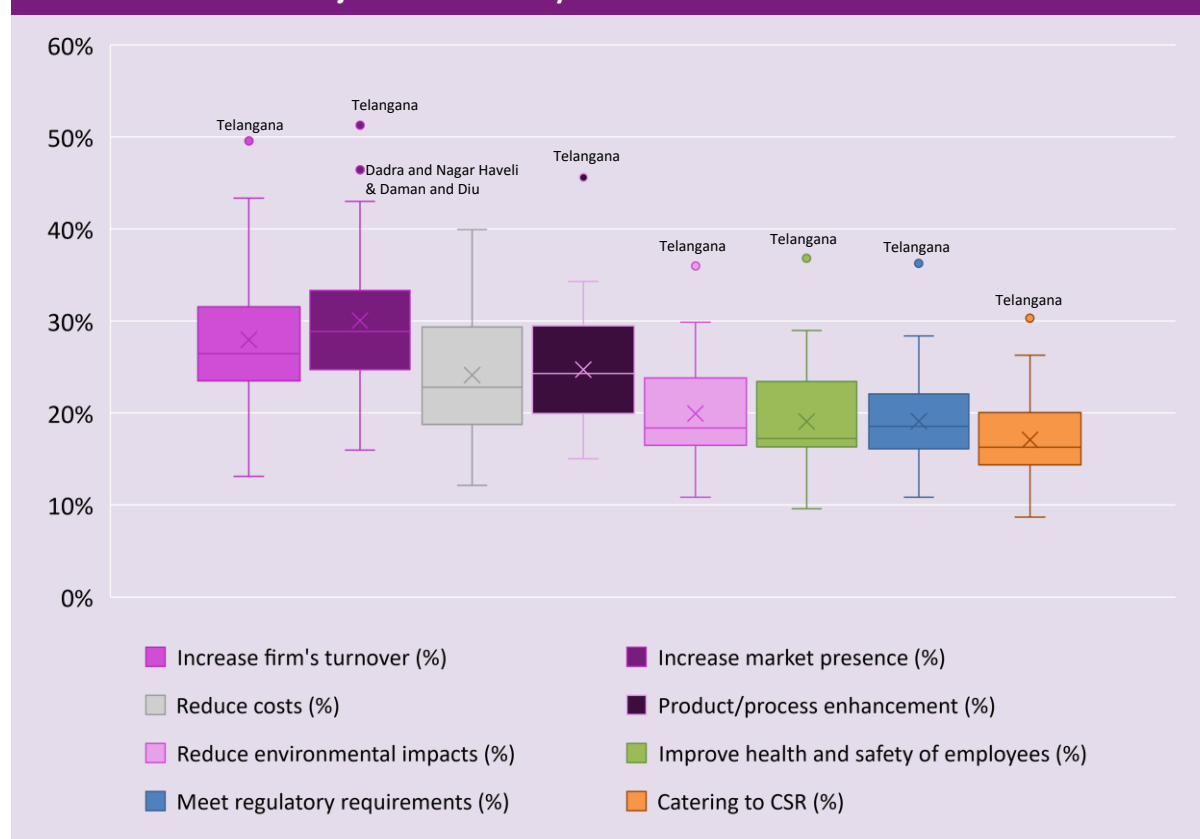
It is noteworthy that out of the 42.30% of large product innovators, a majority of them (26.68%) introduced NTM product innovations, while only 14.53% of large business process innovators introduced NTM BPI. This trend is also visible at the all-India level and across other firm sizes.

7.2. INNOVATION OBJECTIVES

7.2.1. INNOVATION OBJECTIVES OF FIRMS: STATE-WISE

As shown in Figure 7.7, in terms of innovation objectives reported by manufacturing and related services firms across various states and union territories (UTs), Telangana stood out as a common outlier across all objectives. On the other hand, Dadra & Nagar Haveli and Daman & Diu was an outlier specifically for an increase in market presence, when compared to the innovation objectives reported by firms in other states or UTs.

FIGURE 7.7: Innovation objectives of firms by state



Based on table 7.3, it can be observed that the highest priority objective reported by all states and union territories (UTs) is to increase market presence, while the least priority objective reported by all is catering to social responsibility. The percentage increase of market presence objective varies between states and UTs, with Telangana reporting the highest percentage increase at 51.27% and Odisha reporting the lowest at 15.97%.

In terms of catering to corporate social responsibility (CSR), Telangana reports the highest percentage at 30.31%, while Bihar reports the lowest at 8.68%. It is worth noting that certain states and UTs, including Chhattisgarh, Haryana, Jharkhand, Karnataka, Tamil Nadu, Himachal Pradesh, Chandigarh, Dadra & Nagar Haveli and Daman & Diu, Goa, and Jammu & Kashmir, have reported their top 3 objectives as increasing the firm's turnover, increasing market presence, and reducing costs.

On the other hand, the remaining states and UTs have reported their top 3 objectives as increasing the firm's turnover, market presence, and enhancing product/process quality and quantity. These findings provide valuable insights into the priorities of states and UTs in terms of business objectives, which can inform business strategies and policies tailored to the specific needs of each region.

According to the data presented, the all-India average of business-oriented objectives is reported across four objectives, namely increasing the firm's turnover, increasing market presence, reducing costs, and enhancing product/process quality and quantity, which

accounts for 27.36%. On the other hand, the all-India average of socio-regulatory and environmental objectives is reported across four objectives, including reducing environmental impacts, improving the health and safety of the firm's employees, meeting regulatory requirements (e.g., standards, etc.), and catering to CSR, which is 19.12%.

The difference between these two averages is 8.24%, which represents the all-India average of business-oriented objectives minus the all-India average of socio-regulatory and environmental objectives. It is worth noting that across all states and at the all-India level, a higher number of firms report business-oriented objectives compared to socio-regulatory and environmental objectives. A higher difference indicates that a state is more business-oriented in its innovation activities.

States and UTs such as Dadra & Nagar Haveli and Daman & Diu (18.75%), Gujarat (12.07%), Telangana (11.76%), Madhya Pradesh (9.42%), Karnataka (9.25%), Maharashtra (8.95%), Jharkhand (8.57%), Rajasthan (8.44%), Punjab (8.28%), and Goa (8.14%) have a higher share of firms reporting business-oriented objectives minus socio-regulatory and environmental objectives compared to the national average of the same. These findings provide important insights into the priorities of firms across different states and UTs, which can inform policy decisions aimed at promoting a more balanced approach to business innovation that takes into account both business and socio-regulatory and environmental objectives.

TABLE 7.3: Business oriented versus socio-regulatory and environmental objectives of firms by state

States	Increase firm's turnover	Increase market presence	Reduce costs	Product/process enhancement	Business oriented objectives (average)	Reduce environmental impacts	Improve health and safety of employees	Meet regulatory requirements	Catering to CSR	Socio-regulatory & environmental objectives (average)	Business oriented objectives (average) minus socio-regulatory & environmental objectives (average)
All-India	28.70%	30.75%	24.71%	25.27%	27.36%	20.32%	19.41%	19.40%	17.35%	19.12%	8.24%
MAJOR STATES											
Andhra Pradesh	24.87%	27.44%	18.72%	20.00%	22.76%	17.69%	16.41%	16.41%	14.62%	16.28%	6.47%
Bihar	18.56%	21.86%	15.27%	15.87%	17.89%	12.28%	9.58%	12.28%	8.68%	10.70%	7.19%
Chhattisgarh	26.71%	28.88%	22.67%	21.12%	24.84%	18.63%	16.46%	18.94%	16.15%	17.55%	7.30%
Gujarat	36.39%	37.62%	31.93%	33.17%	34.78%	23.02%	23.27%	24.01%	20.54%	22.71%	12.07%
Haryana	29.91%	30.50%	25.51%	24.34%	27.57%	21.41%	20.82%	19.06%	18.18%	19.87%	7.70%
Jharkhand	23.36%	25.55%	18.38%	18.07%	21.34%	14.95%	11.84%	13.40%	10.90%	12.77%	8.57%
Karnataka	38.81%	42.99%	34.93%	33.73%	37.61%	29.85%	28.96%	28.36%	26.27%	28.36%	9.25%
Kerala	26.20%	26.57%	22.51%	24.72%	25.00%	18.08%	17.34%	16.61%	16.24%	17.07%	7.93%
Madhya Pradesh	27.60%	29.38%	24.63%	25.22%	26.71%	17.21%	17.21%	18.40%	16.32%	17.28%	9.42%
Maharashtra	33.72%	37.41%	30.25%	31.64%	33.26%	26.33%	24.71%	23.56%	22.63%	24.31%	8.95%
Odisha	13.10%	15.97%	12.14%	15.02%	14.06%	10.86%	10.86%	10.86%	10.22%	10.70%	3.35%
Punjab	28.85%	29.18%	22.95%	24.26%	26.31%	19.34%	17.05%	18.69%	17.05%	18.03%	8.28%
Rajasthan	25.97%	27.79%	22.34%	22.86%	24.74%	17.14%	16.88%	16.88%	14.29%	16.30%	8.44%
Tamil Nadu	31.90%	33.33%	29.89%	29.89%	31.25%	25.29%	24.14%	22.70%	22.13%	23.56%	7.69%
Telangana	49.58%	51.27%	39.94%	45.61%	46.60%	35.98%	36.83%	36.26%	30.31%	34.84%	11.76%
Uttar Pradesh	24.58%	25.99%	18.93%	20.06%	22.39%	16.38%	15.54%	16.67%	13.84%	15.61%	6.78%
West Bengal	19.53%	19.83%	18.37%	18.95%	19.17%	16.33%	16.33%	16.03%	14.58%	15.82%	3.35%
HILL STATES											
Assam	24.66%	27.40%	16.89%	20.09%	22.26%	16.89%	14.61%	17.81%	14.61%	15.98%	6.28%
Himachal Pradesh	23.01%	23.89%	19.91%	19.91%	21.68%	16.37%	17.26%	16.37%	15.93%	16.48%	5.20%
North-Eastern States (Exc. Assam)	19.08%	23.66%	16.03%	16.79%	18.89%	11.45%	11.45%	12.21%	9.92%	11.26%	7.63%
Uttarakhand	30.52%	33.33%	27.70%	29.58%	30.28%	23.94%	23.47%	22.54%	22.54%	23.12%	7.16%
UT & CITY STATES											
Chandigarh	26.13%	28.83%	26.13%	27.03%	27.03%	23.42%	21.62%	20.72%	17.12%	20.72%	6.31%
Dadra & Nagar Haveli & Daman & Diu	43.33%	46.43%	39.05%	34.29%	40.77%	25.95%	24.29%	20.24%	17.62%	22.02%	18.75%
Goa	33.71%	37.71%	31.43%	29.14%	33.00%	24.00%	25.14%	26.86%	23.43%	24.86%	8.14%
Jammu & Kashmir	22.83%	23.37%	20.11%	17.93%	21.06%	17.39%	16.30%	15.22%	14.67%	15.90%	5.16%
New Delhi	26.95%	29.34%	24.25%	25.15%	26.42%	20.96%	19.46%	20.06%	18.56%	19.76%	6.66%
Puducherry	23.84%	24.42%	19.77%	22.09%	22.53%	16.86%	16.86%	13.95%	13.95%	15.41%	7.12%

> National Average (Business minus socio-regulatory and environmental objectives)

< National Average (Business minus socio-regulatory and environmental objectives)

Top three objectives statewide

7.2.2. INNOVATION OBJECTIVES OF FIRMS: SECTOR-WISE

It can be inferred from Table 7.4 that all the sectors prioritize increasing their market presence, while catering to social responsibility is the least significant objective across most sectors. Notably, the food & beverages, textiles and apparel, paper and related products, pharmaceuticals, medicinal chemical, and botanical products sectors have reported meeting regulatory requirements (e.g. standards, etc.) as their least common objective. The other and diversified manufacturing sector has reported the highest percentage (57.92%) for the increase market presence objective, whereas the wholesale and retail trade and repair of motor vehicles and motorcycles sector has reported the lowest percentage (13.10%) for the same objective. Moreover, the other and diversified manufacturing sector has reported the highest percentage (44.26%) for the catering to social responsibility objective, while the wholesale and retail trade and repair of motor vehicles and motorcycles sector has reported the lowest percentage (1.79%) for the same objective.

Several sectors such as paper and related products, chemicals and chemical products, rubber and plastics products, basic metals, machinery and equipment, and wholesale trade, except motor vehicles and motorcycles, have reported their top 3 objectives as increasing the firm's turnover, increasing market presence, and reducing costs. On the other hand, the remaining sectors have reported increasing the firm's turnover, increasing market presence, and product/process enhancement in terms of quality and quantity as their top 3 objectives. However, there are a few exceptions; firms from the other

non-metallic mineral products (NIC 23) sector have reported increasing the firm's turnover, increasing market presence, meeting regulatory requirements (e.g. standards, etc.), while firms from the wholesale trade, except of motor vehicles and motorcycles (NIC 46) sector have reported increasing the firm's turnover, increasing market presence, reducing costs, and improving the health and safety of the firm's employees.

According to the available data, the all-India average of business-oriented objectives is the average of four objectives, namely increasing the firm's turnover, increasing market presence, reducing costs, and enhancing product/process in terms of quality and quantity. This average is recorded at 27.36%. On the other hand, the all-India average of socio-regulatory and environmental objectives is the average of four objectives, namely reducing environmental impact, improving the health and safety of the firm's employees, meeting regulatory requirements (e.g. standards, etc.), and meeting regulatory requirements (e.g. standards, etc.). This average is noted at 19.12%.

It is worth noting that the difference between these two averages is 8.24%. A larger difference indicates that the sectors are more business oriented. As per the available data, certain sectors such as rubber and plastic products (NIC 22) (20.51%), machinery and equipment (NIC 28) (20.18%), chemicals and chemical products (NIC 20) (14.06%), and computer, electronic and electrical equipment (NIC 26 & 27) (8.82%) have a higher share of firms reporting business-oriented objectives minus socio-regulatory and environmental objectives when compared to the national average of the same.

TABLE 7.4: Business oriented versus socio-regulatory and environmental objectives of firms by sector

States	Increase firm's turnover	Increase market presence	Reduce costs	Product/process enhancement	Business oriented objectives (average)	Reduce environmental impacts	Improve health and safety of employees	Meet regulatory requirements	Catering to CSR	Socio-regulatory & environmental objectives (average)	Business oriented objectives (average) minus socio-regulatory & environmental objectives (average)
All-India	28.70%	30.75%	24.71%	25.27%	27.36%	20.32%	19.41%	19.40%	17.35%	19.12%	8.24%
Food and Beverages (NIC 10 & 11)	18.11%	20.31%	15.25%	17.98%	17.91%	12.52%	11.65%	11.05%	11.12%	11.58%	6.32%
Textiles and Apparels (NIC 13 & 14)	22.20%	23.31%	20.00%	21.26%	21.69%	16.38%	16.85%	15.59%	15.91%	16.18%	5.51%
Wood and related products (NIC 16)	40.91%	42.21%	38.31%	38.96%	40.10%	35.06%	31.82%	31.82%	28.57%	31.82%	8.28%
Paper and related products (NIC 17)	40.63%	41.67%	38.89%	36.46%	39.41%	35.07%	34.38%	33.33%	33.68%	34.11%	5.30%
Printing and reproduction of recorded media (NIC 18)	34.65%	38.61%	35.64%	38.61%	36.88%	25.74%	26.73%	26.73%	21.78%	25.25%	11.63%
Chemicals and chemical products (NIC 20)	42.86%	45.39%	36.87%	35.71%	40.21%	31.57%	26.96%	26.04%	20.05%	26.15%	14.06%
Pharmaceuticals, medicinal chemical and botanical products (NIC 21)	23.94%	24.71%	22.01%	22.78%	23.36%	20.85%	20.08%	18.53%	18.92%	19.59%	3.76%
Rubber and plastics products (NIC 22)	45.84%	49.78%	41.31%	35.91%	43.21%	26.13%	25.84%	21.75%	17.08%	22.70%	20.51%
Other non-metallic mineral products (NIC 23)	12.89%	14.44%	6.98%	6.88%	10.30%	5.62%	3.59%	8.14%	3.20%	5.14%	5.16%
Basic metals (NIC 24)	15.98%	17.12%	13.01%	12.79%	14.73%	9.13%	8.68%	7.76%	7.53%	8.28%	6.45%
Fabricated metal products, except machinery and equipment (NIC 25)	54.20%	54.68%	51.08%	52.52%	53.12%	48.44%	48.20%	49.16%	48.44%	48.56%	4.56%
Computer, Electronic and Electrical Equipment (NIC 26 & 27)	43.98%	46.22%	35.29%	41.18%	41.67%	31.09%	32.21%	35.29%	32.77%	32.84%	8.82%
Machinery and equipment (NIC 28)	46.18%	48.50%	38.87%	38.87%	43.11%	24.25%	22.92%	24.92%	19.60%	22.92%	20.18%
Motor vehicles, trailers and semi-trailers (NIC 29)	23.81%	25.00%	19.64%	20.24%	22.17%	19.05%	16.67%	14.88%	16.67%	16.82%	5.36%
Other and Diversified Manufacturing (NIC 32 & 34)	54.64%	57.92%	51.91%	53.01%	54.37%	46.45%	47.54%	48.63%	44.26%	46.72%	7.65%
Wholesale and retail trade and repair of motor vehicles and motorcycles (NIC 45)	10.12%	13.10%	5.36%	10.12%	9.67%	4.17%	3.57%	2.38%	1.79%	2.98%	6.70%
Wholesale trade, except of motor vehicles and motorcycles (NIC 46)	15.52%	17.24%	12.07%	10.78%	13.90%	10.78%	12.07%	11.64%	10.34%	11.21%	2.69%

> National Average (Business minus socio-regulatory and environmental objectives)

< National Average (Business minus socio-regulatory and environmental objectives)

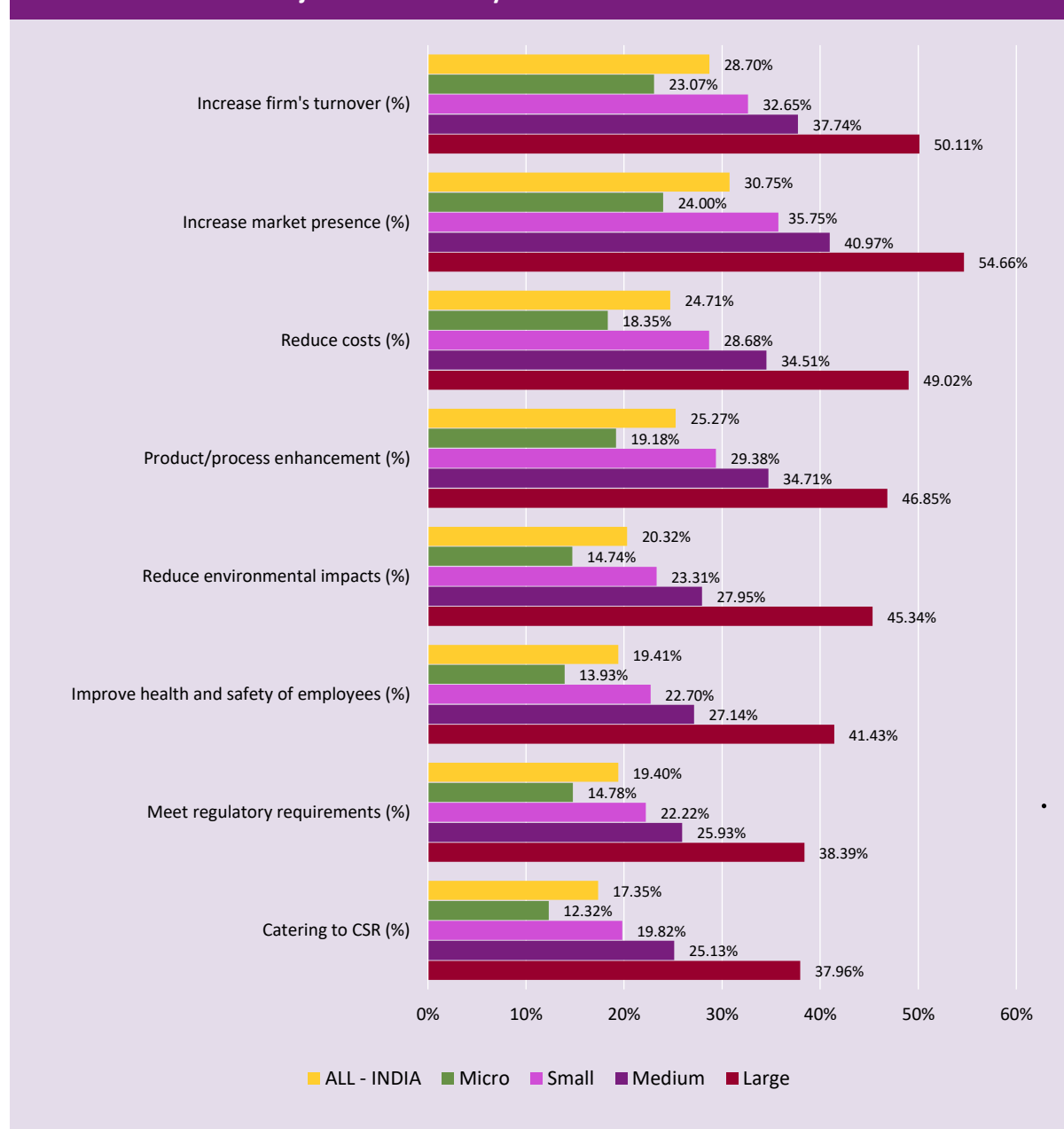
Top three objectives statewide

7.2.3. INNOVATION OBJECTIVES OF FIRMS: SIZE-WISE

Based on the data presented in Figure 7.8, the highest reported objective across all size bins is an increase in market presence, while catering to CSR is the least reported objective. Moreover, there is a noticeable difference between the reporting of firms regarding business-oriented

objectives and socio-regulatory and environmental objectives across all size-bins. Micro, small, and medium firms report the top three objectives as follows: 1) increase in market presence, 2) increase in the firm's turnover, and 3) product/process enhancement in terms of quantity and quality. In contrast, large firms report reducing costs as their third top objective.

FIGURE 7.8: Innovation objectives of firms by size



Large firms' objectives include a 54.66% increase in market presence, 46.85% enhancement in products/processes, 49.02% reduction in costs, 45.34% reduction in environmental impact, 41.43% improvement in employee health and safety, 38.39% meeting regulations, and 37.96% catering to CSR. Medium firms' objectives comprise a 40.97% increase in market presence, 34.71% enhancement in products/processes, 34.51% reduction in costs, 27.95% reduction in environmental impact, 27.14% improvement in employee health and safety, 25.93% meeting regulations, and 25.13% catering to CSR.

Small firms' objectives consist of a 35.75% increase in market presence, 29.38% enhancement in products/processes, 28.68% reduction in costs, 23.31% reduction in environmental impact, 22.70% improvement in employee health and safety, 22.22% meeting regulations, and 19.82% catering to CSR. Lastly, micro firms' objectives include a 24.00% increase in market presence, 19.18% enhancement in products/processes, 18.35% reduction in costs,

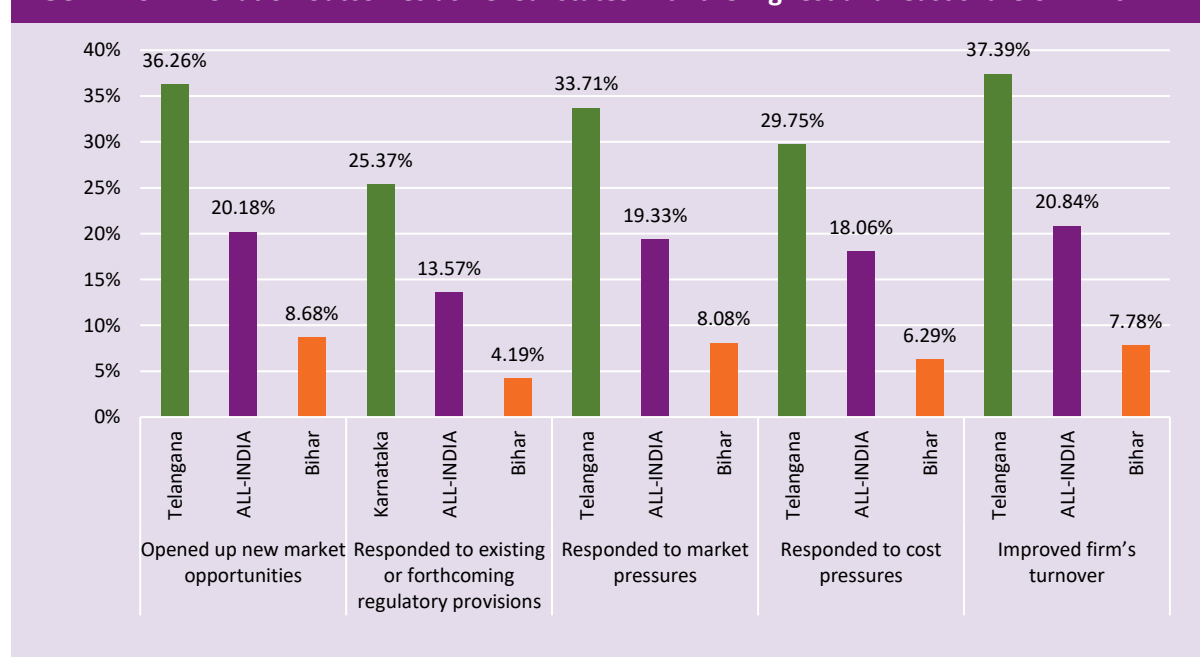
14.74% reduction in environmental impact, 13.93% improvement in employee health and safety, 14.78% meeting regulations, and 12.32% catering to CSR.

7.3. INNOVATION OUTCOMES

7.3.1. INNOVATION OUTCOMES ACHIEVED BY FIRMS: STATE-WISE

The Innovation Outcomes Pillar comprises five crucial indicators, including opening up new market opportunities, responding to regulatory provisions, responding to market and cost pressures, and enhancing the firm's turnover. Based on Figure 7.9, Telangana reports the highest percentage of firms for all outcomes, except for "responding to existing or forthcoming regulatory provisions," whereas Bihar reports consistently low for all outcomes. "Improving the firm's turnover" is the highest reported outcome, whereas "responding to existing or forthcoming regulatory provisions" is the lowest.

FIGURE 7.9: Innovation outcomes achieved: states with the highest and least share of firms



According to Figure 7.9 and Table 7.5, the Innovation Outcomes Pillar comprises five essential indicators, including opening up new market opportunities, responding to existing or forthcoming regulatory provisions, responding to market pressures, responding to cost pressures, and enhancing the firm's turnover.

- **Opened up new market opportunities**

The findings indicate that across India, 20.18% of firms reported that innovation had led to the opening up of new market opportunities. Telangana (36.26%) and Karnataka (34.33%) had the highest share of firms reporting this outcome, while Jammu and Kashmir (13.59%), West Bengal (13.41%), Chhattisgarh (12.11%), Jharkhand (11.21%), Odisha (11.18%), and Bihar (8.68%) had the lowest share of firms reporting this outcome.

- **Responded to existing or forthcoming regulatory provisions**

In terms of responding to existing or forthcoming regulatory provisions, 13.57% of firms reported this outcome across India. Karnataka (25.37%), Telangana (22.10%), Uttarakhand (21.13%), and Tamil Nadu (18.68%) had the highest share of firms reporting this outcome, whereas Chhattisgarh (8.39%), Jharkhand (7.79%), North-eastern states (excluding Assam) (6.11%), and Bihar (4.19%) had the lowest share of firms reporting this outcome.

- **Responded to market pressures**

Moreover, 19.33% of firms reported that innovation had resulted in responding to market pressures across India. Telangana (33.71%), Karnataka (32.84%), and Uttarakhand (26.29%) had the highest share of firms reporting this outcome, while Jammu and Kashmir (13.04%), Chhattisgarh (11.49%), Odisha (11.18%), Jharkhand (9.97%), and Bihar (8.08%) had the lowest share of firms reporting this outcome.

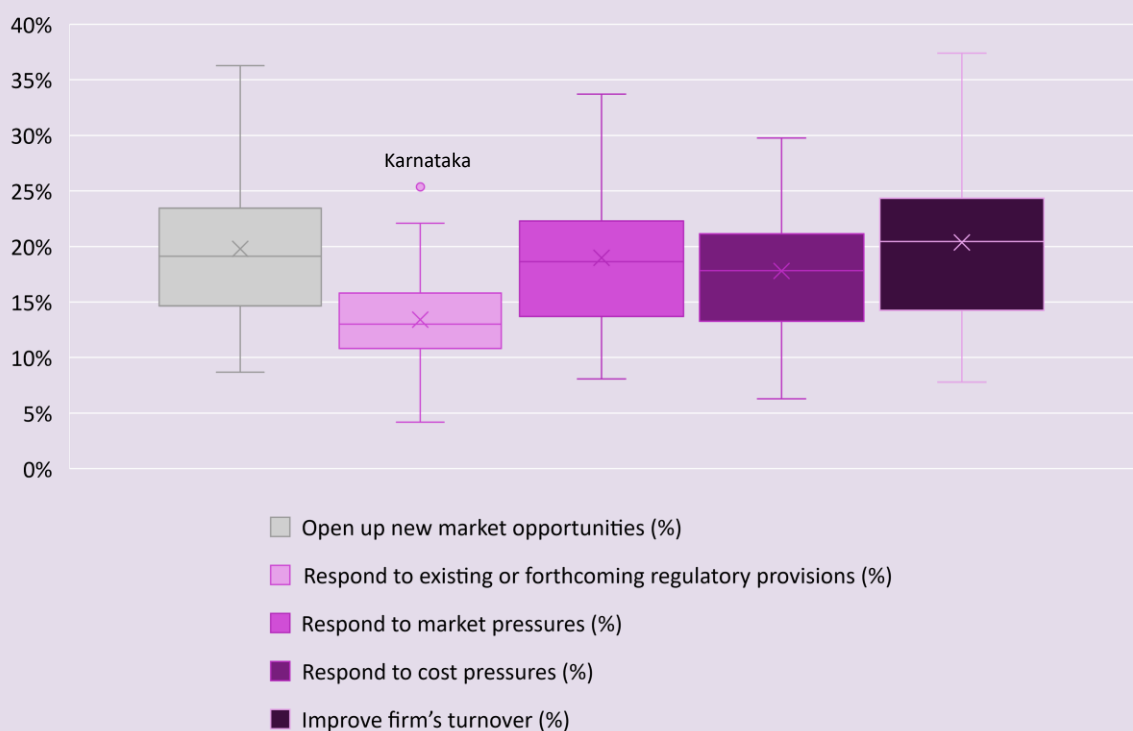
- **Responded to cost pressures**

Similarly, 18.06% of firms reported that innovation had led to responding to cost pressures across India. Telangana (29.75%), Karnataka (29.55%), Tamil Nadu (25.57%), and Uttarakhand (25.35%) had the highest share of firms reporting this outcome, whereas Chhattisgarh (12.11%), Odisha (11.18%), Jammu and Kashmir (10.33%), Jharkhand (9.97%), and Bihar (6.29%) had the lowest share of firms reporting this outcome.

- **Improve firm's turnover**

Finally, 20.84% of firms reported that innovation had resulted in improving the firm's turnover across India. Telangana (37.29%), Karnataka (34.33%), and Tamil Nadu (27.87%) had the highest share of firms reporting this outcome, while West Bengal (13.41%), Chhattisgarh (13.35%), Jammu and Kashmir (13.04%), Jharkhand (11.53%), Odisha (11.50%), and Bihar (7.78%) had the lowest share of firms reporting this outcome.

FIGURE 7.10: Innovation outcomes achieved: distribution of states



It can be observed that the mean of "responding to existing or forthcoming regulatory provisions" is lower than the means of the other four outcomes. Karnataka is the only outlier in achieving the innovation outcome of responding to the existing or forthcoming regulatory provisions through innovations. The state's share of firms that achieved this outcome is way above the overall mean for this particular outcome. This suggests that Karnataka has performed exceptionally well in responding to existing or forthcoming regulatory provisions through innovations compared to the other states.

Table 7.5 provides a classification of states and UTs based on their performance in terms of the share of firms reporting key indicators of innovation outcomes. The "best performer" category comprises states with a share of firms

reporting a particular indicator greater than the all-India share plus the standard deviation of that indicator. The "average performer" category includes states with the share of firms reporting a particular indicator between the all-India share plus standard deviation and all-India share minus standard deviation. States with a share of firms reporting a particular indicator less than the all-India share minus standard deviation are classified under the "low performer" category.

Among the states, Telangana, Karnataka, Tamil Nadu, and Uttarakhand emerged as the best performers across most of the innovation outcomes. Responding to existing or forthcoming regulatory provisions and responding to cost pressures had the highest number of best-performing states (4) across all the outcomes.

TABLE 7.5: Innovation outcomes: the best, average and lowest performers among states

States	Open up new market opportunities	Respond to existing or forthcoming regulatory provisions	Respond to market pressures	Respond to cost pressures	Improve firm's turnover
All-India	20.18%	13.57%	19.33%	18.06%	20.84%
MAJOR STATES					
Andhra Pradesh	18.46%	10.77%	18.46%	16.15%	19.23%
Bihar	8.68%	4.19%	8.08%	6.29%	7.78%
Chhattisgarh	12.11%	8.39%	11.49%	12.11%	13.35%
Gujarat	20.79%	11.88%	18.56%	13.86%	21.53%
Haryana	23.46%	15.84%	22.58%	21.11%	24.63%
Jharkhand	11.21%	7.79%	9.97%	9.97%	11.53%
Karnataka	34.33%	25.37%	32.84%	29.55%	34.33%
Kerala	22.14%	15.87%	21.40%	19.56%	22.88%
Madhya Pradesh	18.40%	15.73%	18.10%	18.69%	18.40%
Maharashtra	25.87%	15.70%	23.79%	23.33%	27.25%
Odisha	11.18%	9.90%	11.18%	11.18%	11.50%
Punjab	19.34%	14.10%	18.36%	17.70%	20.66%
Rajasthan	18.70%	13.25%	18.70%	17.92%	20.26%
Tamil Nadu	26.44%	18.68%	25.29%	25.57%	27.87%
Telangana	36.26%	22.10%	33.71%	29.75%	37.39%
Uttar Pradesh	19.21%	11.02%	18.08%	16.38%	19.49%
West Bengal	13.41%	11.08%	13.70%	13.12%	13.41%
HILL STATES					
Assam	15.07%	10.96%	13.70%	13.70%	14.16%
Himachal Pradesh	19.03%	13.27%	19.91%	17.26%	19.47%
North-Eastern States (Exc. Assam)	14.50%	6.11%	13.74%	12.21%	14.50%
Uttarakhand	25.35%	21.13%	26.29%	25.35%	25.82%
UT & CITY STATES					
Chandigarh	18.92%	12.61%	19.82%	18.02%	18.02%
Dadra & Nagar Haveli & Daman & Diu	24.29%	11.67%	24.05%	21.43%	26.19%
Goa	23.43%	15.43%	18.86%	21.14%	23.43%
Jammu & Kashmir	13.59%	9.78%	13.04%	10.33%	13.04%
New Delhi	20.96%	16.47%	20.66%	20.66%	21.26%
Puducherry	18.60%	12.79%	17.44%	17.44%	22.09%
All-India % <i>plus</i> standard deviation	26.73%	18.35%	25.58%	23.92%	27.75%
All-India % <i>minus</i> standard deviation	13.63%	8.79%	13.08%	12.20%	13.93%

Best Performers
Above national average + standard deviation

Average Performers
Between national average + standard deviation and national average - standard deviation

Low Performers
Below national average - standard deviation

7.3.2. INNOVATION OUTCOMES ACHIEVED BY FIRMS: SECTOR-WISE

In accordance with the findings presented in Figure 7.11, the computer, electronic, and electrical equipment sector exhibited the greatest representation of firms reporting for all outcomes. Conversely, other non-metallic mineral products consistently displayed lower levels of reporting across all outcomes. Of note, the outcome associated with the highest

reported rate was "opening up new market opportunities" and "improving the firm's turnover," while the outcome with the lowest reported rate was "responding to existing or forthcoming regulatory provisions." This outcome's reported rate is akin to the data from state sources. It is crucial to consider these outcomes when evaluating the relative success of various industry sectors, as they represent vital components of overall business operations.

FIGURE 7.11: Innovation outcomes achieved: sectors with the highest and least share of firms



The results presented in Figure 7.11 and Table 7.6 highlight various sectors' reporting on innovation outcomes. Regarding the outcome of

opening up new market opportunities, the computer, electronic, and electrical equipment sector (43.42%), other and diversified

manufacturing (37.16%), chemicals and chemical products (32.49%), and printing and reproduction of recorded media (30.69%) exhibited the highest share of firms reporting this result. Conversely, the other non-metallic mineral products sector (4.46%) displayed the lowest share of firms reporting this outcome.

In terms of responding to existing or forthcoming regulatory provisions, the computer, electronic and electrical equipment sector (36.97%), printing and reproduction of recorded media (24.75%), and other and diversified manufacturing (22.95%) demonstrated the best share of firms reporting this innovation outcome. However, the wholesale and retail trade and repair of motor vehicles and motorcycles sector (4.17%) and other non-metallic mineral products sector (2.91%) reported the lowest share of firms in this regard.

Regarding responding to market pressures, the computer, electronic and electrical equipment sector (43.14%), other and diversified manufacturing (34.43%), chemicals and chemical products (30.88%), and printing and reproduction of recorded media (30.69%) exhibited the best share of firms reporting this outcome. On the other hand, the other non-metallic mineral products sector (4.46%) had the lowest share of firms reporting this outcome.

Concerning responding to cost pressures, the computer, electronic and electrical equipment sector (41.18%), other and diversified manufacturing (31.15%), and printing and reproduction of recorded media (30.69%) had the best share of firms reporting this outcome. The wholesale and retail trade and repair of motor vehicles and motorcycles sector (8.33%)

and other non-metallic mineral products sector (3.97%) reported the lowest share of firms in this regard.

Finally, the computer, electronic and electrical equipment sector (43.42%), other and diversified manufacturing (37.16%), and chemicals and chemical products (33.41%) demonstrated the best share of firms reporting innovation leading to improvement in firm's turnover as an outcome. However, the wholesale and retail trade and repair of motor vehicles and motorcycles sector (10.71%) and other non-metallic mineral products sector (4.55%) reported the lowest share of firms in this regard. These findings are essential in assessing the relative success of various sectors and their respective innovation outcomes.

Table 7.6 provides a classification of sectors based on their performance in reporting indicators under five key innovation outcomes. The categories include sectors with the best, average and lowest share of firms reporting these indicators. The five indicators are: opening up new market opportunities, responding to existing or upcoming regulatory provisions, responding to market pressures, responding to cost pressures, and enhancing the firm's turnover. The best-performing sectors are those with the share of firms reporting an indicator greater than the all-India share plus the standard deviation for that indicator. The average-performing sectors have a share of firms reporting an indicator between the all-India share plus standard deviation and all-India share minus standard deviation. The low-performing sectors have a share of firms reporting an indicator less than the all-India share minus standard deviation.

TABLE 7.6: Innovation outcomes: the best, average and lowest performers among sectors

Sectors	Open up new market opportunities	Respond to existing or forthcoming regulatory provisions	Respond to market pressures	Respond to cost pressures	Improve firm's turnover
All-India	20.18%	13.57%	19.33%	18.06%	20.84%
Food and Beverages (NIC 10 & 11)	17.44%	10.99%	17.04%	15.78%	18.18%
Textiles and Apparels (NIC 13 & 14)	16.85%	11.81%	16.85%	15.91%	17.48%
Wood and related products (NIC 16)	21.43%	16.23%	20.78%	21.43%	22.08%
Paper and related products (NIC 17)	28.82%	21.88%	27.08%	25.69%	29.17%
Printing and reproduction of recorded media (NIC 18)	30.69%	24.75%	30.69%	30.69%	30.69%
Chemicals and chemical products (NIC 20)	32.49%	17.74%	30.88%	26.73%	33.41%
Pharmaceuticals, medicinal chemical, and botanical products (NIC 21)	24.71%	20.46%	24.32%	24.32%	25.87%
Rubber and plastics products (NIC 22)	22.63%	10.80%	22.04%	18.98%	24.67%
Other non-metallic mineral products (NIC 23)	4.46%	2.91%	4.46%	3.97%	4.55%
Basic metals (NIC 24)	11.19%	8.45%	10.27%	10.27%	13.47%
Fabricated metal products, except machinery and equipment (NIC 25)	20.86%	17.03%	20.14%	20.14%	21.10%
Computer, Electronic and Electrical Equipment (NIC 26 & 27)	43.42%	36.97%	43.14%	41.18%	43.42%
Machinery and equipment (NIC 28)	27.24%	11.63%	23.26%	20.27%	28.24%
Motor vehicles, trailers and semi-trailers (NIC 29)	25.60%	21.43%	25.00%	23.81%	26.79%
Other and Diversified Manufacturing (NIC 32 & 34)	37.16%	22.95%	34.43%	31.15%	37.16%
Wholesale and retail trade and repair of motor vehicles and motorcycles (NIC 45)	11.31%	4.17%	11.31%	8.33%	10.71%
Wholesale trade, except of motor vehicles and motorcycles (NIC 46)	12.50%	9.05%	11.21%	11.64%	12.93%
All-India % <i>plus</i> standard deviation	30.29%	22.08%	29.11%	27.37%	30.88%
All-India % <i>minus</i> standard deviation	10.07%	5.06%	9.55%	8.75%	10.80%

Best Performers

Above national average + standard deviation

Average Performers

Between national average + standard deviation and national average - standard deviation

Low Performers

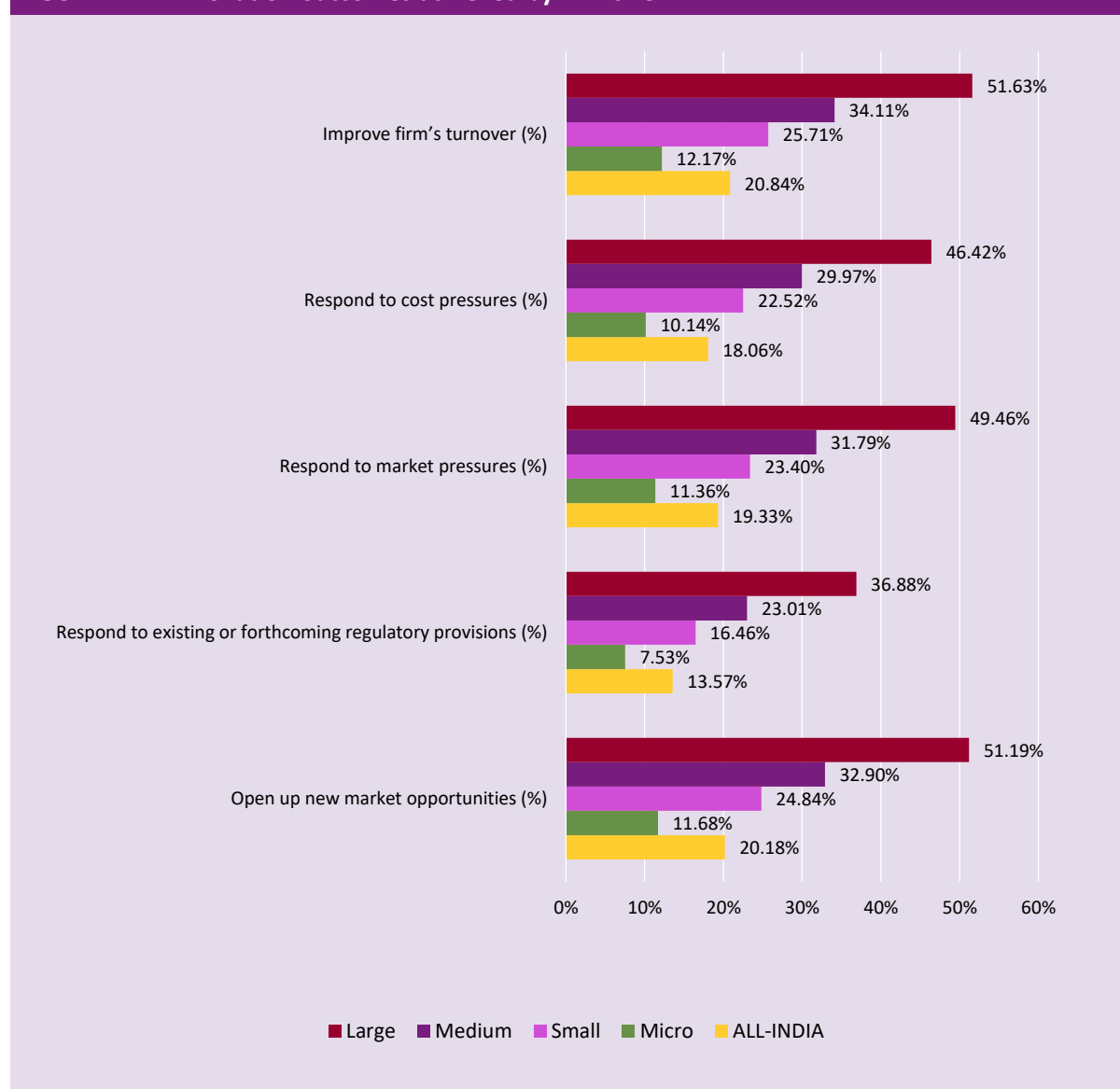
Below national average - standard deviation

Manufacturing and related services firms in sectors such as computer, electronic and electrical equipment, other and diversified manufacturing, printing and reproduction of recorded media, and chemicals and chemical products emerge as the best-performing sectors across most of the outcomes. The highest number of best-performing sectors out of 17 are in opening up new market opportunities and responding to market pressures. It is noteworthy that only 2 sectors were low performers for majority of outcomes.

7.3.2. INNOVATION OUTCOMES ACHIEVED BY FIRMS: SIZE-WISE

Figure 7.12 illustrates the distribution of outcomes across various firm sizes. The data shows that there is a decreasing trend in reported outcomes as we move from "improve firm's turnover" to "responded to existing or forthcoming regulatory provisions." Across all size categories, the majority of firms reported "improve firm's turnover" as their highest outcome.

FIGURE 7.12: Innovation outcomes achieved by firm size



Large size firms reported the following objectives in the following order of priority: 51.63% improve firm's turnover, 51.19% opened up new market opportunities, 49.46% responded to market pressures, 46.42% responded to cost pressures, and 36.88% responded to existing or forthcoming regulatory provisions.

Medium size firms reported the following objectives in the following order of priority: 34.11% improve firm's turnover, 32.90% opened up new market opportunities, 31.79% responded to market pressures, 29.97% responded to cost pressures, and 23.01% responded to existing or forthcoming regulatory provisions.

Small size firms reported the following objectives in the following order of priority:

25.71% improve firm's turnover, 24.84% opened up new market opportunities, 23.40% responded to market pressures, 22.52% responded to cost pressures, and 16.46% responded to existing or forthcoming regulatory provisions.

Micro size firms reported the following objectives in the following order of priority: 12.17% improve firm's turnover, 11.68% opened up new market opportunities, 11.36% responded to market pressures, 10.14% responded to cost pressures, and 7.53% responded to existing or forthcoming regulatory provisions. These findings suggest that firms of different sizes prioritize different outcomes, with large firms focusing more on improving their turnover, while smaller firms focusing more on opening up new market opportunities and responding to market pressures.



8

STATE PROFILES



Andhra Pradesh

IMI
Overall
Rank

22

IMI
Score

24.25

Category

IMI Category Rank

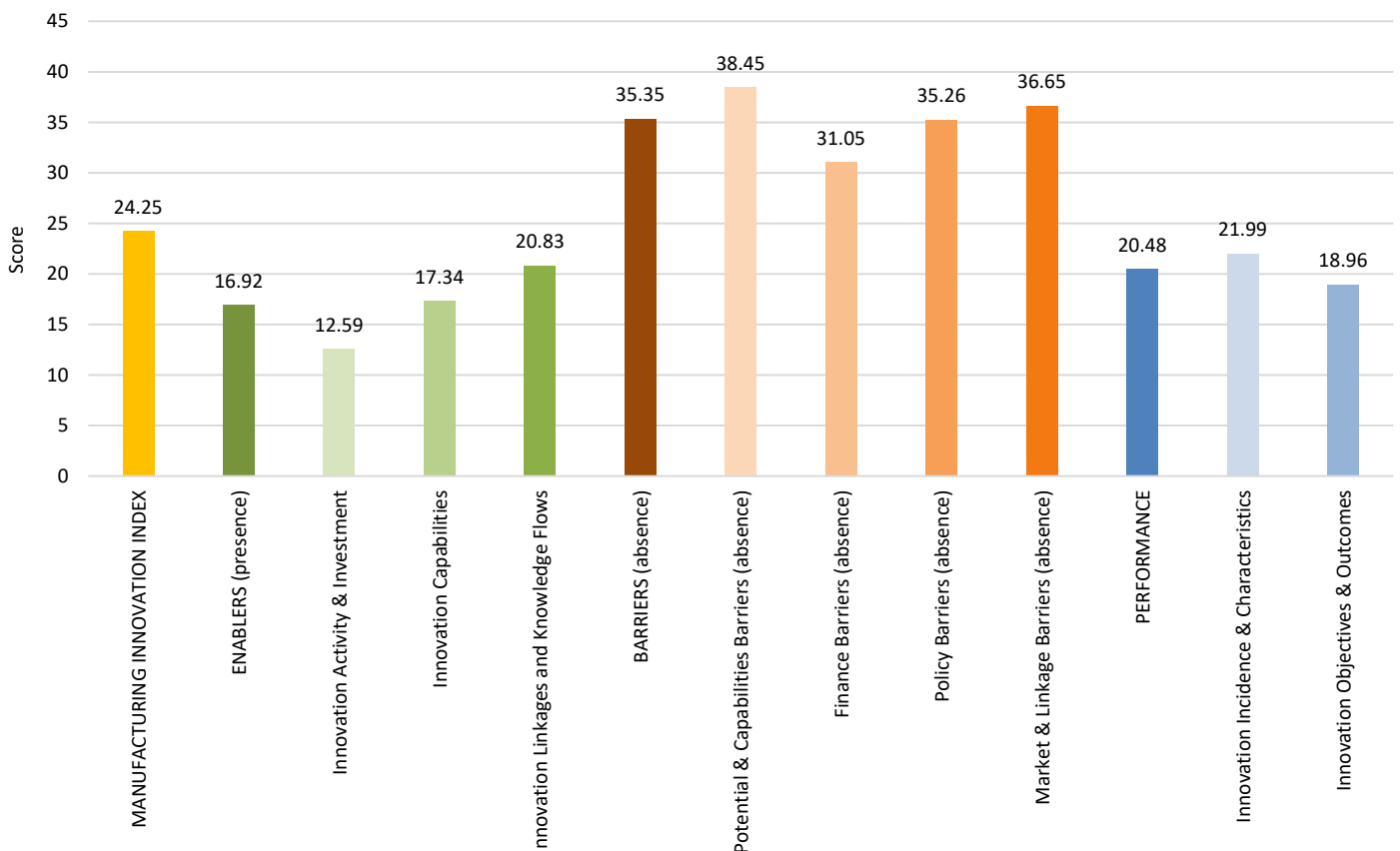
GSDP per capita (INR lakhs)

Major States

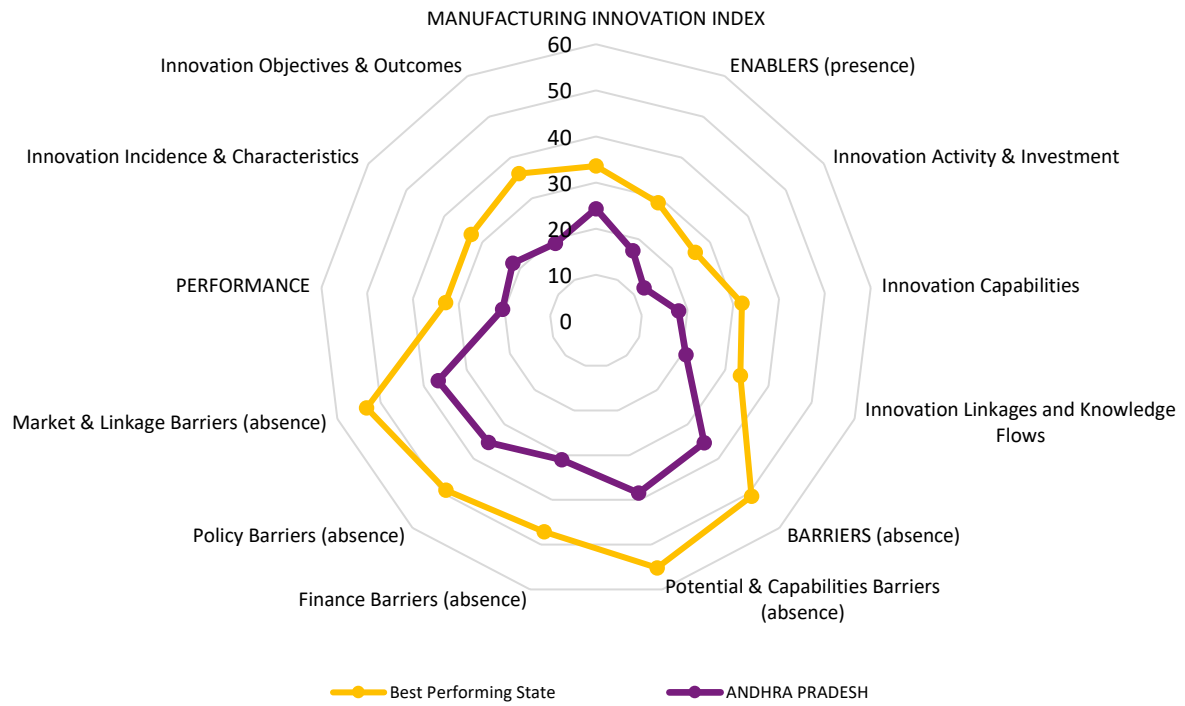
14

1.15

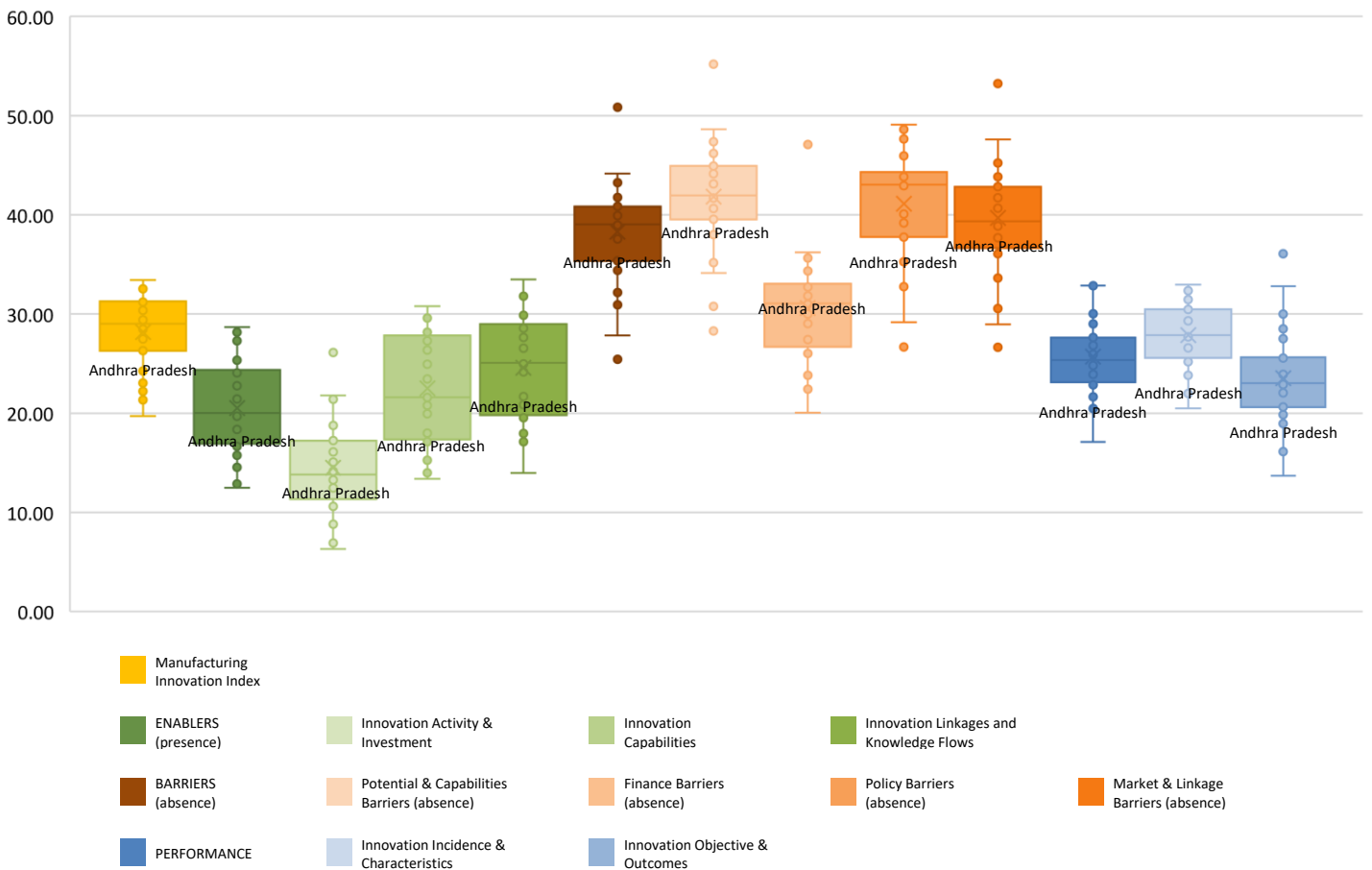
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score					24.25					Peer Group Performance					•
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Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	16.92	•	21	14	Barriers (absence)	35.35	•	21	14	Performance	20.48	•	26	17

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1 Innovation Activity & Investment		12.59	•	19	14
1.1	Firms engaging in tangible innovation input activities	13.59	•	2	2
1.2	Firms engaging in knowledge-based capital (intangible) activities	9.49	•	21	13
1.3	Firms investing in tangible activities	14.10	•	15	9
1.4	Firms investing in knowledge-based capital (intangible) activities	13.08	•	23	15

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2 Innovation Capabilities		17.34	•	21	13
2.1	Firms with internal sources of financing	20.77	•	16	9
2.2	Firms with internal funding available for training	16.92	•	21	13
2.3	Firms with R&D Staff	9.49	•	20	12
2.4	Firms using innovative tools and practices among staff that are successful	11.54	•	16	9
2.5	Firms employing/ engaging experts in advanced digital tools in house	13.59	•	24	16
2.6	Firms employing highly qualified personnel, by level of educational attainment	21.03	•	24	15
2.7	Firms highly satisfied with innovation capabilities of employees	48.97	•	17	11
2.8	Firms using advanced, enabling or emerging technologies	2.56	•	24	16
2.9	Firms making use of internal information sources for innovation	23.33	•	26	18
2.10	Firms with an R&D strategy	8.46	•	23	15
2.11	Firms with an I4.0 strategy	1.28	•	24	16

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3 Innovation Linkages and Knowledge Flows		20.83	•	20	13
3.1	Firms highly satisfied with investment climate in the state	42.31	•	21	14
3.2	Firms highly satisfied with ease of doing business in the state	44.36	•	23	15
3.3	Firms highly satisfied with govt. support for enabling innovation	34.36	•	21	14
3.4	Firms highly satisfied with innovation infrastructure in the state	40.26	•	20	13
3.5	Firms highly satisfied with innovation capabilities of external talent pool	32.31	•	15	9
3.6	Firms with formal cooperation agreements	1.79	•	21	14
3.7	Firms with informal cooperation agreements	1.79	•	27	18
3.8	Firms engaging experts in advanced digital tools from external sources	1.54	•	27	18
3.9	Firms selling products in international markets	15.38	•	21	14
3.10	Firms importing from international markets	7.18	•	17	9
3.11	Firms that collaborated with other parties on innovation activities within India	6.15	•	26	17
3.12	Firms that collaborated with other parties on innovation activities from abroad	1.28	•	23	14
3.13	Firms making use of external information sources for innovation	24.62	•	25	17
3.14	Firms with external sources of financing	15.38	•	2	2
3.15	Firms with external funding available for training	5.38	•	1	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4 Potential & Capabilities Barriers Pillar Score		38.45	•	22	15
4.1	Innovation capabilities (R&D, design, etc.) insufficient	36.67	•	18	12
4.2	Organizational rigidities within the firm	40.26	•	22	15
4.3	No need due to prior innovations by this firm	42.56	•	21	14
4.4	Lack of qualified personnel	36.15	•	19	12
4.5	Lack of good ideas for innovations	37.69	•	23	16
4.6	Lack of firm-level infrastructure	37.18	•	22	15

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5 Finance Barriers Pillar Score		31.05	•	14	9
5.1	Lack of funds within the firm or group	29.74	•	7	5
5.2	Lack of finance from sources outside the firm (credit)	31.28	•	13	8
5.3	Excessive perceived risks	31.79	•	18	11
5.4	Innovation costs too high	31.54	•	13	8

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6 Policy Barriers Pillar Score		35.26	•	24	16
6.1	Regulations, standards, taxation	37.69	•	22	15

6.2	Weakness of intellectual property rights	43.59	•	22	15
6.3	Legislative barriers	24.87	•	24	16

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7 Market & Linkage Barriers Pillar Score		36.65	•	21	14
7.1	Lack of information on markets	36.92	•	22	15
7.2	Deficiencies in the availability of external services	33.08	•	24	16
7.3	Difficulty in finding cooperation partners	34.87	•	24	16
7.4	Lack of information on technology	36.67	•	18	11
7.5	Market dominated by established firms	36.41	•	21	14
7.6	No need due to very little competition in firm's market	43.59	•	22	15
7.7	Uncertain demand for innovative goods or services	35.38	•	19	14
7.8	Low demand for innovations in your market	37.69	•	10	6

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8 Innovation Incidence & Characteristics		21.99	•	26	17
8.1	Firms with new or significantly improved goods	9.23	•	22	14
8.2	Firms with new or significantly improved services	2.05	•	20	13
8.3	Share of new-to-market (NTM) product innovators	26.32	•	25	17
8.4	Firms with at least one type of product innovation developed entirely in-house	92.11	•	24	16
8.5	Firms into innovations in operations and product/process development	16.92	•	4	4
8.6	Firms into innovations in marketing and Sales	6.67	•	12	6
8.7	Firms into innovations in procurement, logistics, and distribution	3.59	•	20	12
8.8	Firms into innovations in administration and management	3.59	•	18	11
8.9	Share of new-to-market (NTM) business process innovators	6.06	•	26	17
8.10	Firms with at least one type of business process innovation developed entirely in-house	55.00	•	27	18

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9 Innovation Objectives & Outcomes		18.96	•	24	16
Objectives					
9.1	Increase the firm's turnover	24.87	•	17	12
9.2	Increase market presence	27.44	•	16	11
9.3	Reduce costs	18.72	•	21	13
9.4	Product/process enhancement in terms of quality and quantity	20.00	•	20	14
9.5	Reduce environmental impacts	17.69	•	15	10
9.6	Improve health and safety of the firm's employees	16.41	•	19	12
9.7	Meet regulatory requirements (e.g., standards, etc.)	16.41	•	19	14
9.8	Catering to Corporate Social Responsibility	14.62	•	18	11
Outcomes					
9.9	Opened up new market opportunities	18.46	•	18	11
9.10	Responded to existing or forthcoming regulatory provisions	10.77	•	21	14
9.11	Responded to market pressures	18.46	•	15	9
9.12	Responded to cost pressures	16.15	•	18	11
9.13	Improved firm's turnover	19.23	•	17	11
9.14	Firms reporting turnover from new-to-market product innovations	23.68	•	26	17
9.15	Firms reporting turnover from NTM business process innovations	6.06	•	27	18
9.16	Turnover of an innovative firm (% of GSDP per capita)	30.03	•	20	15
9.17	Employment in innovative firms (as a percentage of total employment)	50.52	•	7	5
9.18	Firms that were granted IP rights	8.21	•	27	18
9.19	Firms that attained innovation outcomes through I4.0 technologies	2.56	•	21	13

States in the peer group based on similar GSDP per capita
Rajasthan, Telangana, New Delhi, Madhya Pradesh, Kerala, Haryana

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation
² Between national average plus standard deviation and national average minus standard deviation
³ Less than national average minus standard deviation



Assam

IMI
Overall
Rank

25

IMI
Score

22.22

Category

Hill States

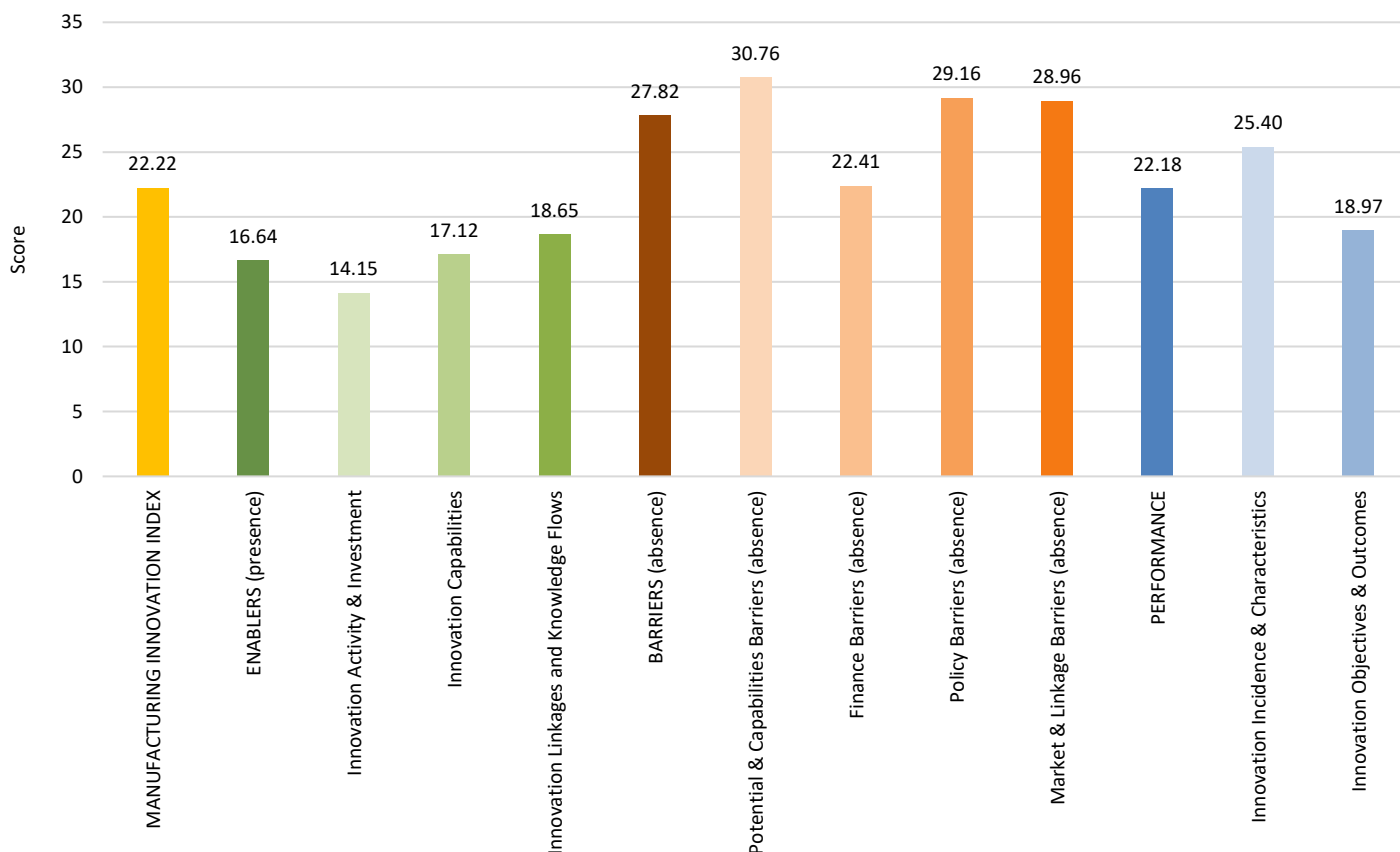
IMI Category Rank

17

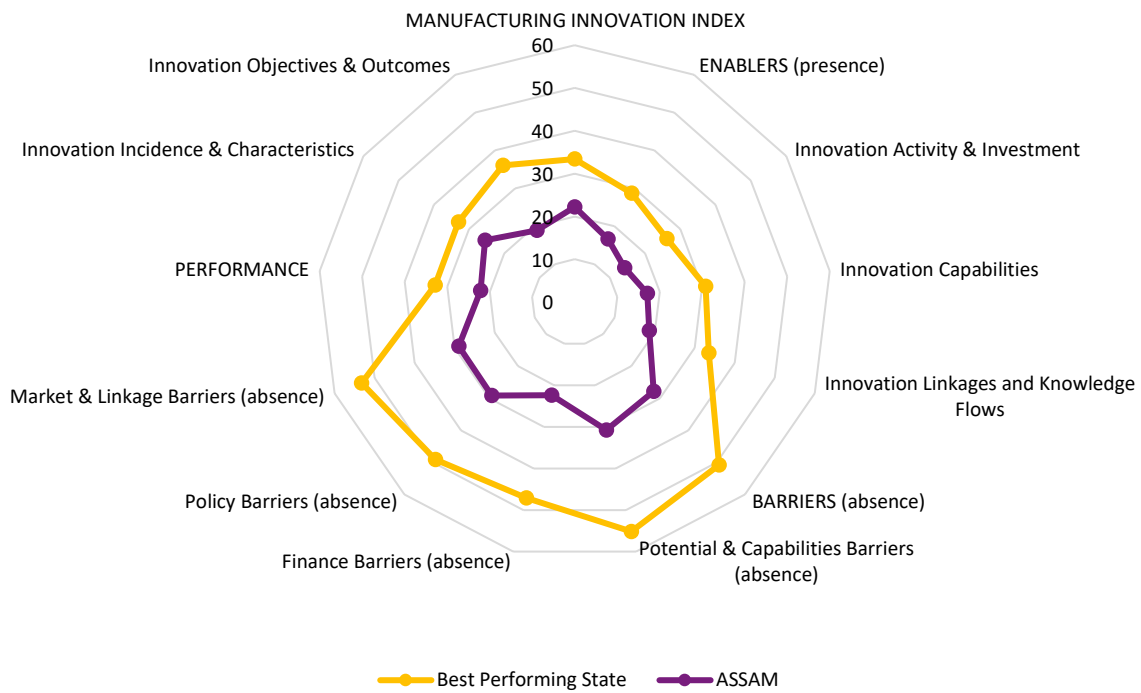
GSDP per capita (INR lakhs)

0.16

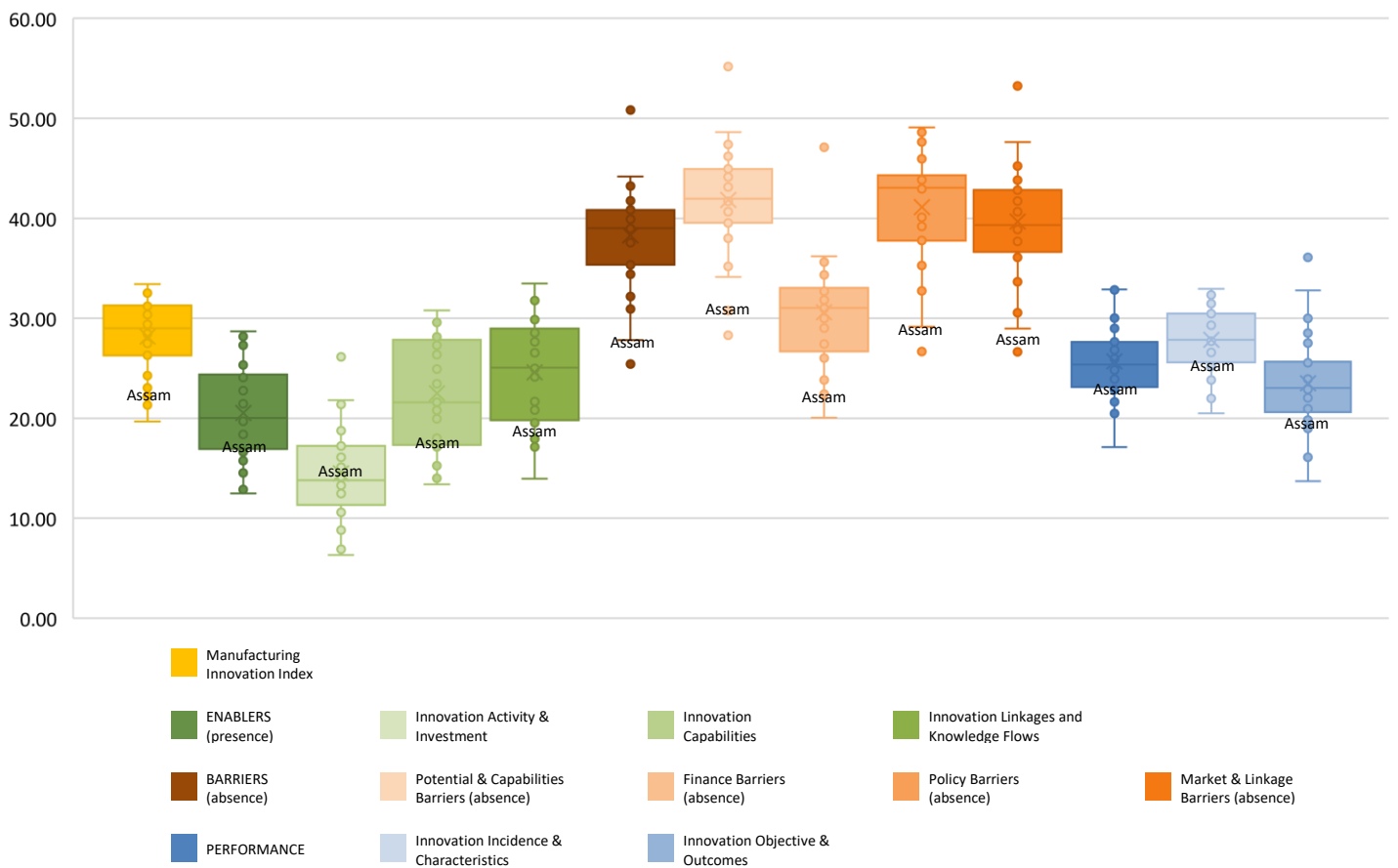
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

22.2

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	16.64	•	22	15

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Barriers (absence)	27.82	•	26	18

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1 Innovation Activity & Investment		14.15	•	12	7
1.1	Firms engaging in tangible innovation input activities	13.24	•	3	3
1.2	Firms engaging in knowledge-based capital (intangible) activities	11.87	•	17	11
1.3	Firms investing in tangible activities	15.98	•	8	4
1.4	Firms investing in knowledge-based capital (intangible) activities	15.53	•	22	14

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2 Innovation Capabilities		17.12	•	23	15
2.1	Firms with internal sources of financing	18.72	•	18	11
2.2	Firms with internal funding available for training	16.89	•	22	14
2.3	Firms with R&D Staff	10.96	•	17	10
2.4	Firms using innovative tools and practices among staff that are successful	12.79	•	15	8
2.5	Firms employing/ engaging experts in advanced digital tools in house	13.24	•	25	17
2.6	Firms employing highly qualified personnel, by level of educational attainment	24.66	•	20	12
2.7	Firms highly satisfied with innovation capabilities of employees	36.99	•	26	18
2.8	Firms using advanced, enabling or emerging technologies	5.48	•	17	10
2.9	Firms making use of internal information sources for innovation	23.74	•	25	17
2.10	Firms with an R&D strategy	10.96	•	21	13
2.11	Firms with an I4.0 strategy	2.74	•	20	12

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3 Innovation Linkages and Knowledge Flows		18.65	•	23	16
3.1	Firms highly satisfied with investment climate in the state	37.44	•	26	18
3.2	Firms highly satisfied with ease of doing business in the state	36.99	•	26	18
3.3	Firms highly satisfied with govt. support for enabling innovation	25.11	•	26	18
3.4	Firms highly satisfied with innovation infrastructure in the state	32.88	•	24	17
3.5	Firms highly satisfied with innovation capabilities of external talent pool	29.68	•	18	12
3.6	Firms with formal cooperation agreements	1.83	•	20	13
3.7	Firms with informal cooperation agreements	6.39	•	6	5
3.8	Firms engaging experts in advanced digital tools from external sources	3.65	•	24	15
3.9	Firms selling products in international markets	11.87	•	23	15
3.10	Firms importing from international markets	4.57	•	23	15
3.11	Firms that collaborated with other parties on innovation activities within India	14.61	•	13	8
3.12	Firms that collaborated with other parties on innovation activities from abroad	2.28	•	20	13
3.13	Firms making use of external information sources for innovation	35.62	•	7	5
3.14	Firms with external sources of financing	9.13	•	4	3
3.15	Firms with external funding available for training	3.65	•	5	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4 Potential & Capabilities Barriers Pillar Score		30.76	•	26	18
4.1	Innovation capabilities (R&D, design, etc.) insufficient	27.85	•	26	18
4.2	Organizational rigidities within the firm	30.14	•	27	18
4.3	No need due to prior innovations by this firm	32.88	•	26	18
4.4	Lack of qualified personnel	30.14	•	25	17
4.5	Lack of good ideas for innovations	33.79	•	26	18
4.6	Lack of firm-level infrastructure	30.59	•	26	18

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5 Finance Barriers Pillar Score		22.41	•	26	18
5.1	Lack of funds within the firm or group	21.00	•	23	16
5.2	Lack of finance from sources outside the firm (credit)	21.92	•	26	18
5.3	Excessive perceived risks	24.20	•	26	18
5.4	Innovation costs too high	22.37	•	26	18

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6 Policy Barriers Pillar Score		29.16	•	26	18
6.1	Regulations, standards, taxation	26.94	•	26	18

Peer Group Performance

•

6.2	Weakness of intellectual property rights	36.99	•	26	18
6.3	Legislative barriers	23.74	•	25	17

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7 Market & Linkage Barriers Pillar Score		28.96	•	26	18
7.1	Lack of information on markets	29.22	•	26	18
7.2	Deficiencies in the availability of external services	30.59	•	25	17
7.3	Difficulty in finding cooperation partners	32.42	•	25	17
7.4	Lack of information on technology	29.22	•	26	18
7.5	Market dominated by established firms	24.66	•	27	18
7.6	No need due to very little competition in firm's market	34.25	•	27	18
7.7	Uncertain demand for innovative goods or services	26.03	•	27	18
7.8	Low demand for innovations in your market	25.11	•	26	17

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8 Innovation Incidence & Characteristics		25.40	•	23	15
8.1	Firms with new or significantly improved goods	9.59	•	20	12
8.2	Firms with new or significantly improved services	2.28	•	18	12
8.3	Share of new-to-market (NTM) product innovators	27.27	•	24	16
8.4	Firms with at least one type of product innovation developed entirely in-house	95.45	•	15	10
8.5	Firms into innovations in operations and product/process development	15.53	•	6	6
8.6	Firms into innovations in marketing and Sales	6.85	•	11	5
8.7	Firms into innovations in procurement, logistics, and distribution	7.76	•	6	4
8.8	Firms into innovations in administration and management	4.11	•	15	9
8.9	Share of new-to-market (NTM) business process innovators	14.71	•	20	13
8.10	Firms with at least one type of business process innovation developed entirely in-house	78.38	•	19	11

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9 Innovation Objectives & Outcomes		18.97	•	23	15
Objectives					
9.1	Increase the firm's turnover	24.66	•	18	13
9.2	Increase market presence	27.40	•	17	12
9.3	Reduce costs	16.89	•	24	16
9.4	Product/process enhancement in terms of quality and quantity	20.09	•	18	12
9.5	Reduce environmental impacts	16.89	•	19	13
9.6	Improve health and safety of the firm's employees	14.61	•	23	15
9.7	Meet regulatory requirements (e.g., standards, etc.)	17.81	•	15	10
9.8	Catering to Corporate Social Responsibility	14.61	•	19	12
Outcomes					
9.9	Opened up new market opportunities	15.07	•	20	13
9.10	Responded to existing or forthcoming regulatory provisions	10.96	•	20	13
9.11	Responded to market pressures	13.70	•	22	14
9.12	Responded to cost pressures	13.70	•	20	13
9.13	Improved firm's turnover	14.16	•	21	13
9.14	Firms reporting turnover from new-to-market product innovations	27.27	•	25	16
9.15	Firms reporting turnover from NTM business process innovations	11.76	•	24	17
9.16	Turnover of an innovative firm (% of GSDP per capita)	34.47	•	19	14
9.17	Employment in innovative firms (as a percentage of total employment)	43.28	•	13	9
9.18	Firms that were granted IP rights	21.46	•	5	2
9.19	Firms that attained innovation outcomes through I4.0 technologies	1.83	•	24	16

States in the peer group based on similar GSDP per capita
Rajasthan, Telangana, New Delhi, Madhya Pradesh, Kerala, Haryana

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation



Bihar

IMII
Overall
Rank

26

IMII
Score

21.32

Category

Major States

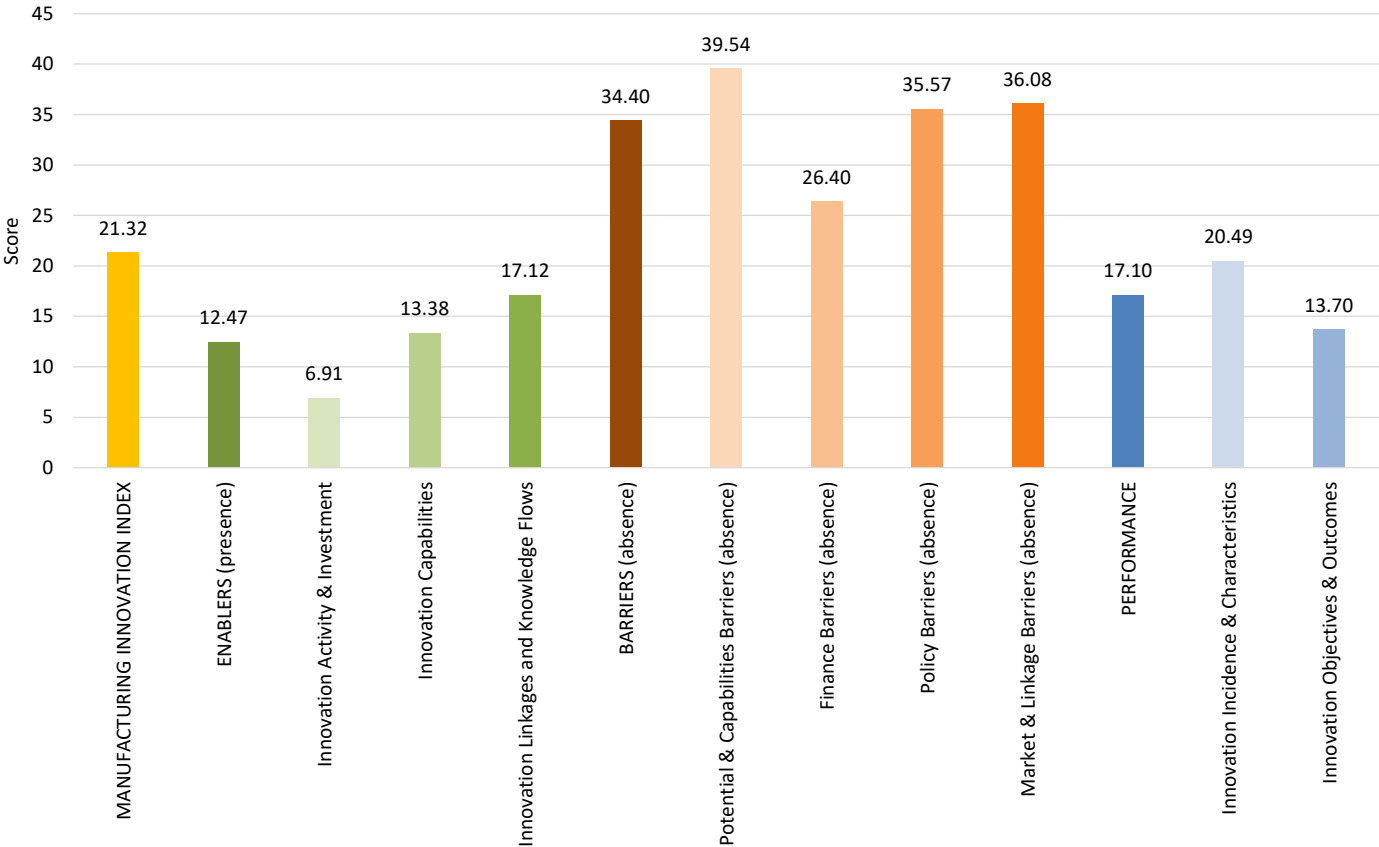
IMII Category Rank

18

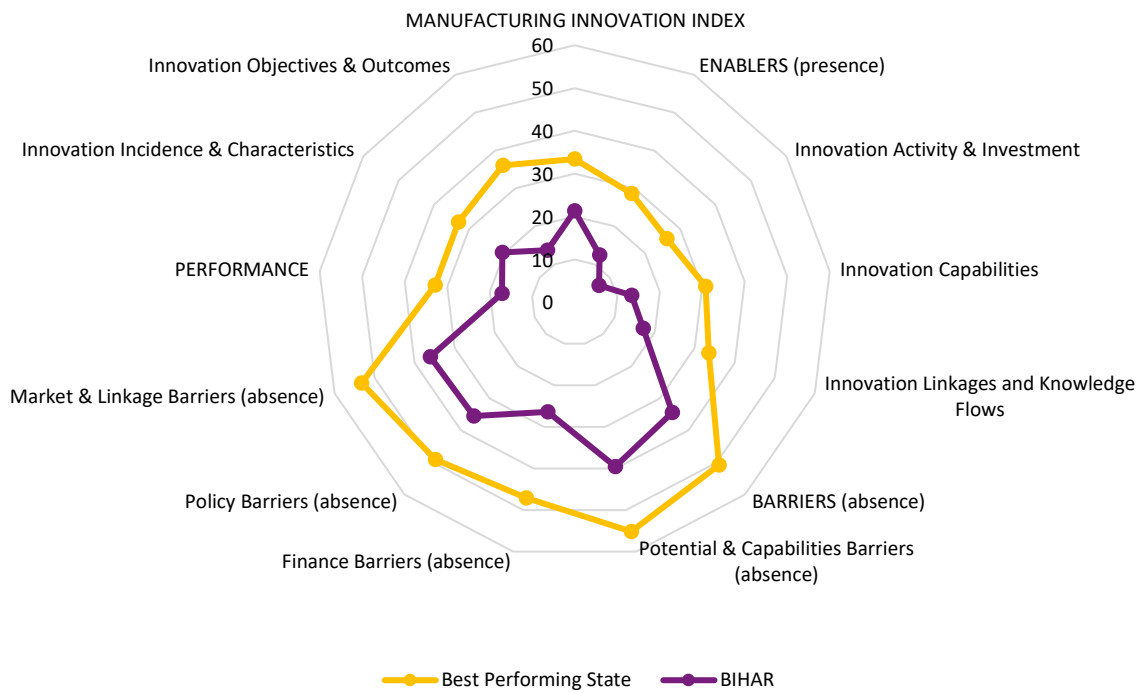
GSDP per capita (INR lakhs)

0.29

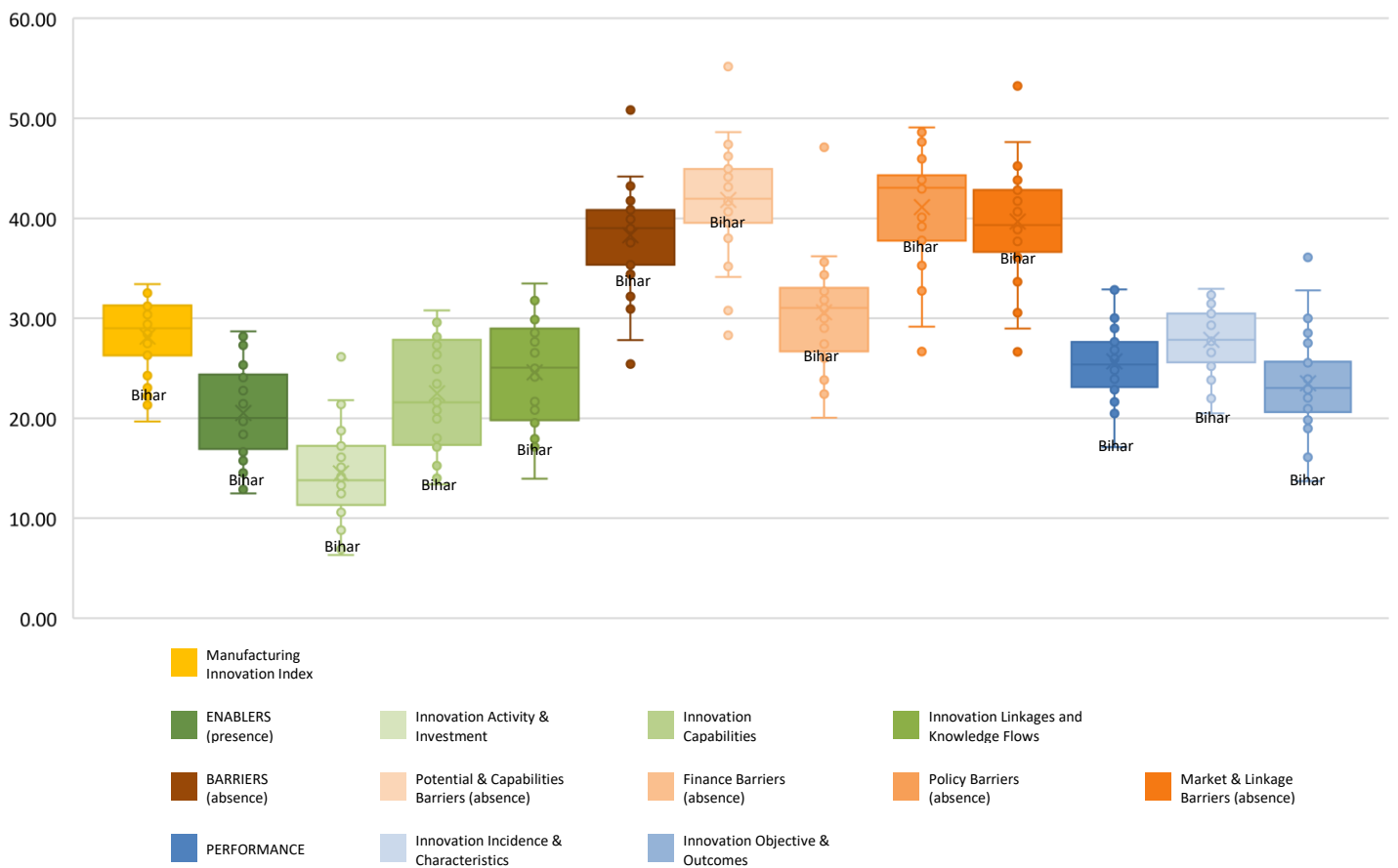
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMI Score

21.32

Peer Group Performance

•

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	12.47	•	27	18	Barriers (absence)	34.40	•	23	16	Performance	17.10	•	27	18

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	6.91	•	26	17
1.1	Firms engaging in tangible innovation input activities	5.39	•	26	17
1.2	Firms engaging in knowledge-based capital (intangible) activities	5.39	•	26	17
1.3	Firms investing in tangible activities	8.98	•	27	18
1.4	Firms investing in knowledge-based capital (intangible) activities	8.08	•	27	18

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	13.38	•	27	18
2.1	Firms with internal sources of financing	11.98	•	26	17
2.2	Firms with internal funding available for training	16.47	•	23	15
2.3	Firms with R&D Staff	3.59	•	26	17
2.4	Firms using innovative tools and practices among staff that are successful	6.59	•	26	17
2.5	Firms employing/ engaging experts in advanced digital tools in house	11.38	•	26	18
2.6	Firms employing highly qualified personnel, by level of educational attainment	14.37	•	27	18
2.7	Firms highly satisfied with innovation capabilities of employees	41.62	•	22	15
2.8	Firms using advanced, enabling or emerging technologies	0.90	•	26	17
2.9	Firms making use of internal information sources for innovation	27.25	•	23	15
2.10	Firms with an R&D strategy	5.09	•	25	17
2.11	Firms with an I4.0 strategy	0.30	•	27	18

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	17.12	•	26	18
3.1	Firms highly satisfied with investment climate in the state	41.02	•	24	16
3.2	Firms highly satisfied with ease of doing business in the state	40.72	•	25	17
3.3	Firms highly satisfied with govt. support for enabling innovation	27.54	•	25	17
3.4	Firms highly satisfied with innovation infrastructure in the state	32.34	•	25	18
3.5	Firms highly satisfied with innovation capabilities of external talent pool	27.84	•	21	15
3.6	Firms with formal cooperation agreements	1.50	•	24	16
3.7	Firms with informal cooperation agreements	1.80	•	26	17
3.8	Firms engaging experts in advanced digital tools from external sources	3.29	•	25	16
3.9	Firms selling products in international markets	6.59	•	27	18
3.10	Firms importing from international markets	1.50	•	26	17
3.11	Firms that collaborated with other parties on innovation activities within India	4.19	•	27	18
3.12	Firms that collaborated with other parties on innovation activities from abroad	0.00	•	27	18
3.13	Firms making use of external information sources for innovation	26.05	•	24	16
3.14	Firms with external sources of financing	5.09	•	18	11
3.15	Firms with external funding available for training	3.89	•	3	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	39.54	•	21	14
4.1	Innovation capabilities (R&D, design, etc.) insufficient	36.23	•	19	13
4.2	Organizational rigidities within the firm	40.42	•	20	13
4.3	No need due to prior innovations by this firm	45.21	•	17	12
4.4	Lack of qualified personnel	36.23	•	17	11
4.5	Lack of good ideas for innovations	40.42	•	22	15
4.6	Lack of firm-level infrastructure	38.92	•	19	13

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	26.40	•	22	15
5.1	Lack of funds within the firm or group	23.95	•	18	11
5.2	Lack of finance from sources outside the firm (credit)	26.05	•	23	16
5.3	Excessive perceived risks	28.44	•	24	17
5.4	Innovation costs too high	27.25	•	22	15

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	35.57	•	23	15
6.1	Regulations, standards, taxation	40.42	•	16	11

6.2	Weakness of intellectual property rights	44.61	•	21	14
6.3	Legislative barriers	22.16	•	27	18

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	36.08	•	23	16
7.1	Lack of information on markets	35.03	•	24	16
7.2	Deficiencies in the availability of external services	35.33	•	22	15
7.3	Difficulty in finding cooperation partners	37.13	•	22	15
7.4	Lack of information on technology	37.13	•	17	10
7.5	Market dominated by established firms	34.73	•	22	15
7.6	No need due to very little competition in firm's market	44.01	•	21	14
7.7	Uncertain demand for innovative goods or services	35.93	•	15	10
7.8	Low demand for innovations in your market	31.74	•	21	15

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	20.49	•	27	18
8.1	Firms with new or significantly improved goods	4.49	•	27	18
8.2	Firms with new or significantly improved services	0.90	•	26	18
8.3	Share of new-to-market (NTM) product innovators	23.53	•	27	18
8.4	Firms with at least one type of product innovation developed entirely in-house	94.12	•	19	14
8.5	Firms into innovations in operations and product/process development	7.19	•	25	17
8.6	Firms into innovations in marketing and Sales	4.49	•	23	15
8.7	Firms into innovations in procurement, logistics, and distribution	0.90	•	27	18
8.8	Firms into innovations in administration and management	3.29	•	21	13
8.9	Share of new-to-market (NTM) business process innovators	4.17	•	27	18
8.10	Firms with at least one type of business process innovation developed entirely in-house	66.67	•	26	17

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	13.70	•	27	18
Objectives					
9.1	Increase the firm's turnover	18.56	•	26	17
9.2	Increase market presence	21.86	•	25	16
9.3	Reduce costs	15.27	•	26	17
9.4	Product/process enhancement in terms of quality and quantity	15.87	•	26	17
9.5	Reduce environmental impacts	12.28	•	25	17
9.6	Improve health and safety of the firm's employees	9.58	•	27	18
9.7	Meet regulatory requirements (e.g., standards, etc.)	12.28	•	25	17
9.8	Catering to Corporate Social Responsibility	8.68	•	27	18
Outcomes					
9.9	Opened up new market opportunities	8.68	•	27	18
9.10	Responded to existing or forthcoming regulatory provisions	4.19	•	27	18
9.11	Responded to market pressures	8.08	•	27	18
9.12	Responded to cost pressures	6.29	•	27	18
9.13	Improved firm's turnover	7.78	•	27	18
9.14	Firms reporting turnover from new-to-market product innovations	23.53	•	27	18
9.15	Firms reporting turnover from NTM business process innovations	12.50	•	23	16
9.16	Turnover of an innovative firm (% of GSDP per capita)	50.47	•	10	8
9.17	Employment in innovative firms (as a percentage of total employment)	18.03	•	27	18
9.18	Firms that were granted IP rights	11.68	•	24	15
9.19	Firms that attained innovation outcomes through I4.0 technologies	0.30	•	27	18

States in the peer group based on similar GSDP per capita
Odisha, Punjab, Haryana, Kerala, Chhattisgarh, Madhya Pradesh

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation

Chandigarh

IMI
Overall
Rank

18

IMI
Score

27.03

Category

UT and City States

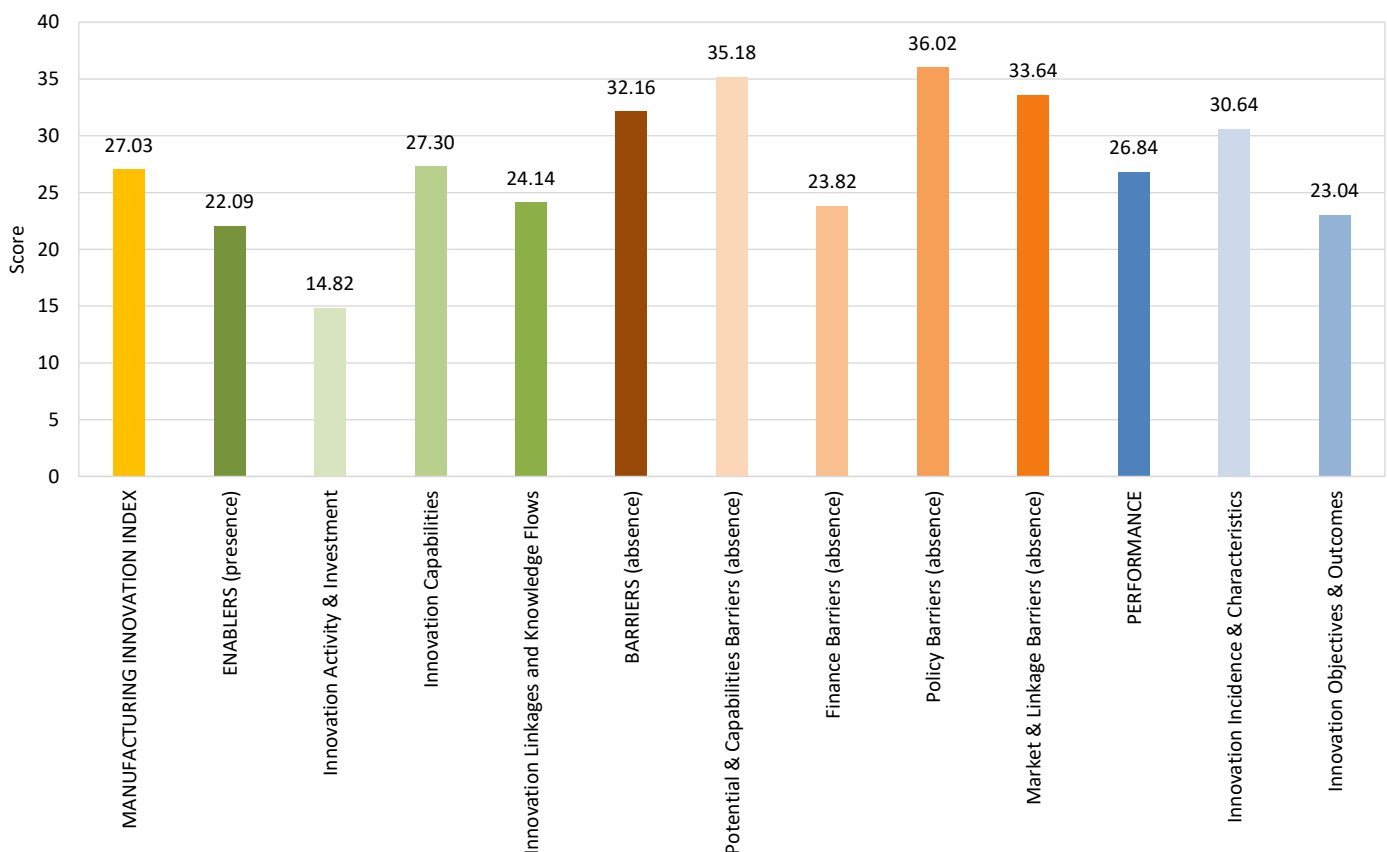
IMI Category Rank

5

GSDP per capita (INR lakhs)

2.34

MANUFACTURING INNOVATION SCORES



IMI Score

27.03

Peer Group Performance

•

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	22.09	•	12	4	Barriers (absence)	32.16	•	24	5	Performance	26.84	•	12	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	14.82	•	11	3
1.1	Firms engaging in tangible innovation input activities	8.11	•	12	3
1.2	Firms engaging in knowledge-based capital (intangible) activities	13.51	•	11	4
1.3	Firms investing in tangible activities	14.41	•	13	4
1.4	Firms investing in knowledge-based capital (intangible) activities	22.52	•	13	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	27.30	•	8	4
2.1	Firms with internal sources of financing	23.42	•	11	3
2.2	Firms with internal funding available for training	33.33	•	1	1
2.3	Firms with R&D Staff	18.92	•	3	2
2.4	Firms using innovative tools and practices among staff that are successful	10.81	•	18	5
2.5	Firms employing/ engaging experts in advanced digital tools in house	32.43	•	3	2
2.6	Firms employing highly qualified personnel, by level of educational attainment	51.35	•	1	1
2.7	Firms highly satisfied with innovation capabilities of employees	48.65	•	18	5
2.8	Firms using advanced, enabling or emerging technologies	9.01	•	6	3
2.9	Firms making use of internal information sources for innovation	33.33	•	19	5
2.10	Firms with an R&D strategy	18.92	•	7	2
2.11	Firms with an I4.0 strategy	5.41	•	8	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	24.14	•	17	5
3.1	Firms highly satisfied with investment climate in the state	50.45	•	17	5
3.2	Firms highly satisfied with ease of doing business in the state	51.35	•	18	5
3.3	Firms highly satisfied with govt. support for enabling innovation	40.54	•	14	4
3.4	Firms highly satisfied with innovation infrastructure in the state	44.14	•	16	4
3.5	Firms highly satisfied with innovation capabilities of external talent pool	26.13	•	22	5
3.6	Firms with formal cooperation agreements	5.41	•	5	2
3.7	Firms with informal cooperation agreements	5.41	•	14	3
3.8	Firms engaging experts in advanced digital tools from external sources	10.81	•	6	3
3.9	Firms selling products in international markets	23.42	•	15	5
3.10	Firms importing from international markets	10.81	•	10	4
3.11	Firms that collaborated with other parties on innovation activities within India	18.92	•	5	2
3.12	Firms that collaborated with other parties on innovation activities from abroad	2.70	•	17	4
3.13	Firms making use of external information sources for innovation	28.83	•	19	4
3.14	Firms with external sources of financing	6.31	•	13	4
3.15	Firms with external funding available for training	0.00	•	27	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	35.18	•	24	5
4.1	Innovation capabilities (R&D, design, etc.) insufficient	29.73	•	25	5
4.2	Organizational rigidities within the firm	37.84	•	24	5
4.3	No need due to prior innovations by this firm	36.94	•	25	5
4.4	Lack of qualified personnel	35.14	•	22	5
4.5	Lack of good ideas for innovations	34.23	•	25	5
4.6	Lack of firm-level infrastructure	36.94	•	24	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	23.82	•	25	5
5.1	Lack of funds within the firm or group	20.72	•	26	5
5.2	Lack of finance from sources outside the firm (credit)	24.32	•	25	5
5.3	Excessive perceived risks	26.13	•	25	5
5.4	Innovation costs too high	24.32	•	25	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	36.02	•	22	5
6.1	Regulations, standards, taxation	33.33	•	24	5

6.2	Weakness of intellectual property rights	40.54	•	24	5
6.3	Legislative barriers	34.23	•	14	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	33.64	•	24	5
7.1	Lack of information on markets	35.14	•	23	5
7.2	Deficiencies in the availability of external services	35.14	•	23	5
7.3	Difficulty in finding cooperation partners	36.04	•	23	5
7.4	Lack of information on technology	32.43	•	24	5
7.5	Market dominated by established firms	34.23	•	23	5
7.6	No need due to very little competition in firm's market	37.84	•	25	5
7.7	Uncertain demand for innovative goods or services	32.43	•	23	5
7.8	Low demand for innovations in your market	27.03	•	24	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	30.64	•	6	2
8.1	Firms with new or significantly improved goods	13.51	•	16	5
8.2	Firms with new or significantly improved services	5.41	•	7	3
8.3	Share of new-to-market (NTM) product innovators	46.67	•	12	3
8.4	Firms with at least one type of product innovation developed entirely in-house	100.00	•	4	1
8.5	Firms into innovations in operations and product/process development	10.81	•	16	3
8.6	Firms into innovations in marketing and Sales	12.61	•	2	1
8.7	Firms into innovations in procurement, logistics, and distribution	8.11	•	4	2
8.8	Firms into innovations in administration and management	8.11	•	3	1
8.9	Share of new-to-market (NTM) business process innovators	25.00	•	8	3
8.10	Firms with at least one type of business process innovation developed entirely in-house	80.00	•	14	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	23.04	•	13	4
Objectives					
9.1	Increase the firm's turnover	26.13	•	15	4
9.2	Increase market presence	28.83	•	14	4
9.3	Reduce costs	26.13	•	9	3
9.4	Product/process enhancement in terms of quality and quantity	27.03	•	9	3
9.5	Reduce environmental impacts	23.42	•	8	3
9.6	Improve health and safety of the firm's employees	21.62	•	9	3
9.7	Meet regulatory requirements (e.g., standards, etc.)	20.72	•	8	2
9.8	Catering to Corporate Social Responsibility	17.12	•	11	4
Outcomes					
9.9	Opened up new market opportunities	18.92	•	15	4
9.10	Responded to existing or forthcoming regulatory provisions	12.61	•	15	4
9.11	Responded to market pressures	19.82	•	11	3
9.12	Responded to cost pressures	18.02	•	12	4
9.13	Improved firm's turnover	18.02	•	19	5
9.14	Firms reporting turnover from new-to-market product innovations	40.00	•	17	3
9.15	Firms reporting turnover from NTM business process innovations	25.00	•	12	3
9.16	Turnover of an innovative firm (% of GSDP per capita)	15.98	•	26	4
9.17	Employment in innovative firms (as a percentage of total employment)	36.30	•	21	5
9.18	Firms that were granted IP rights	23.42	•	2	1
9.19	Firms that attained innovation outcomes through I4.0 technologies	6.31	•	7	3

States in the peer group based on similar GSDP per capita

Puducherry, Ner States, Goa, Himachal Pradesh, Jammu & Kashmir, Uttarakhand

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation



Chhattisgarh

IMI
Overall
Rank

19

IMI
Score

27.02

Category

Major States

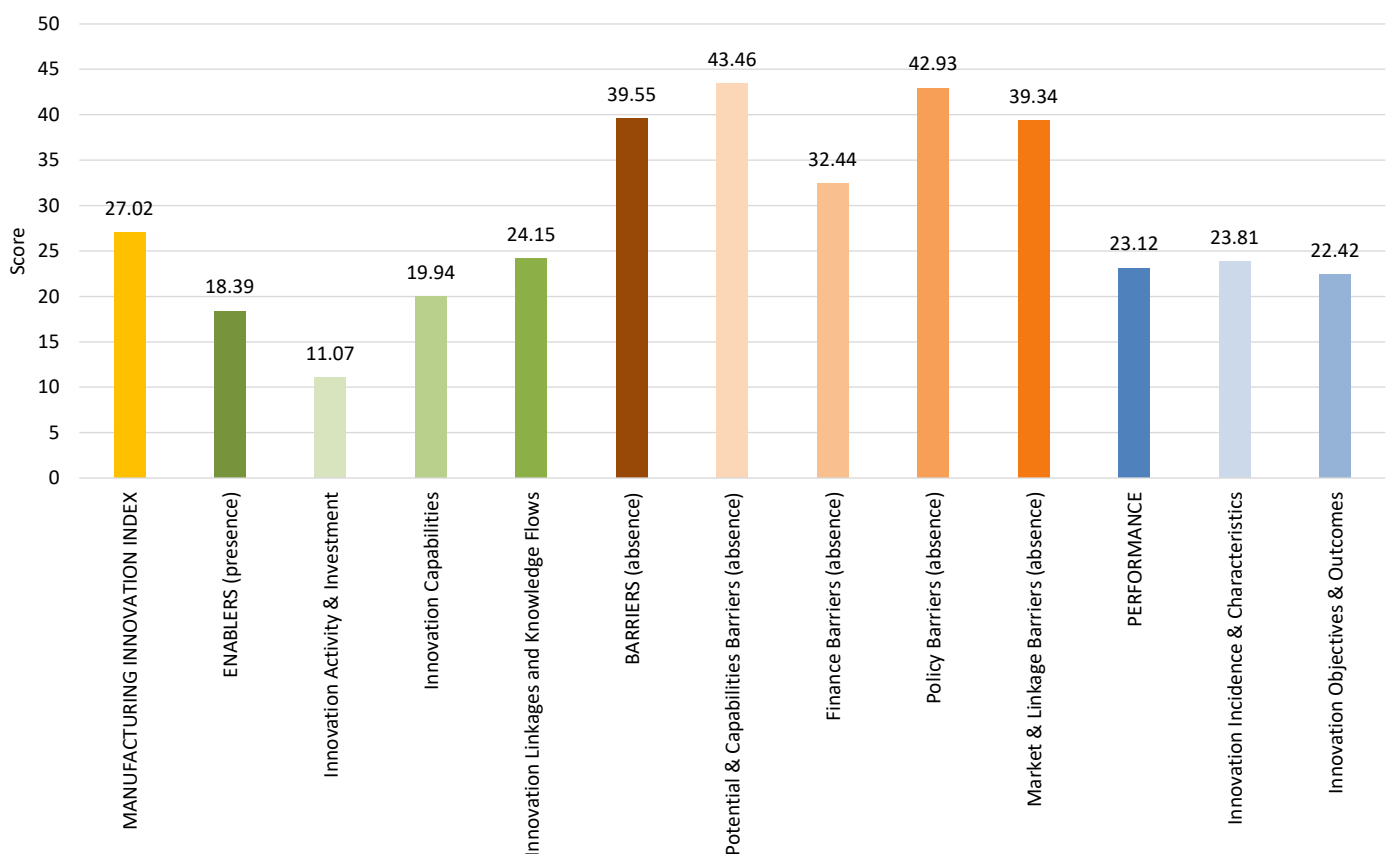
IMI Category Rank

12

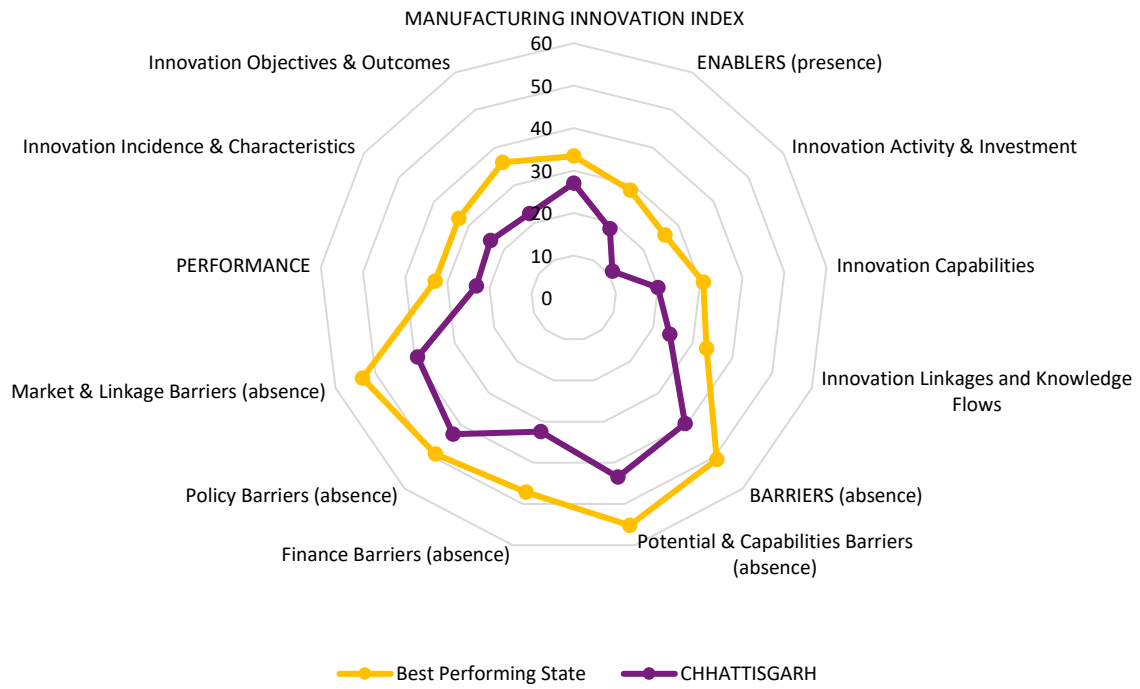
GSDP per capita (INR lakhs)

0.75

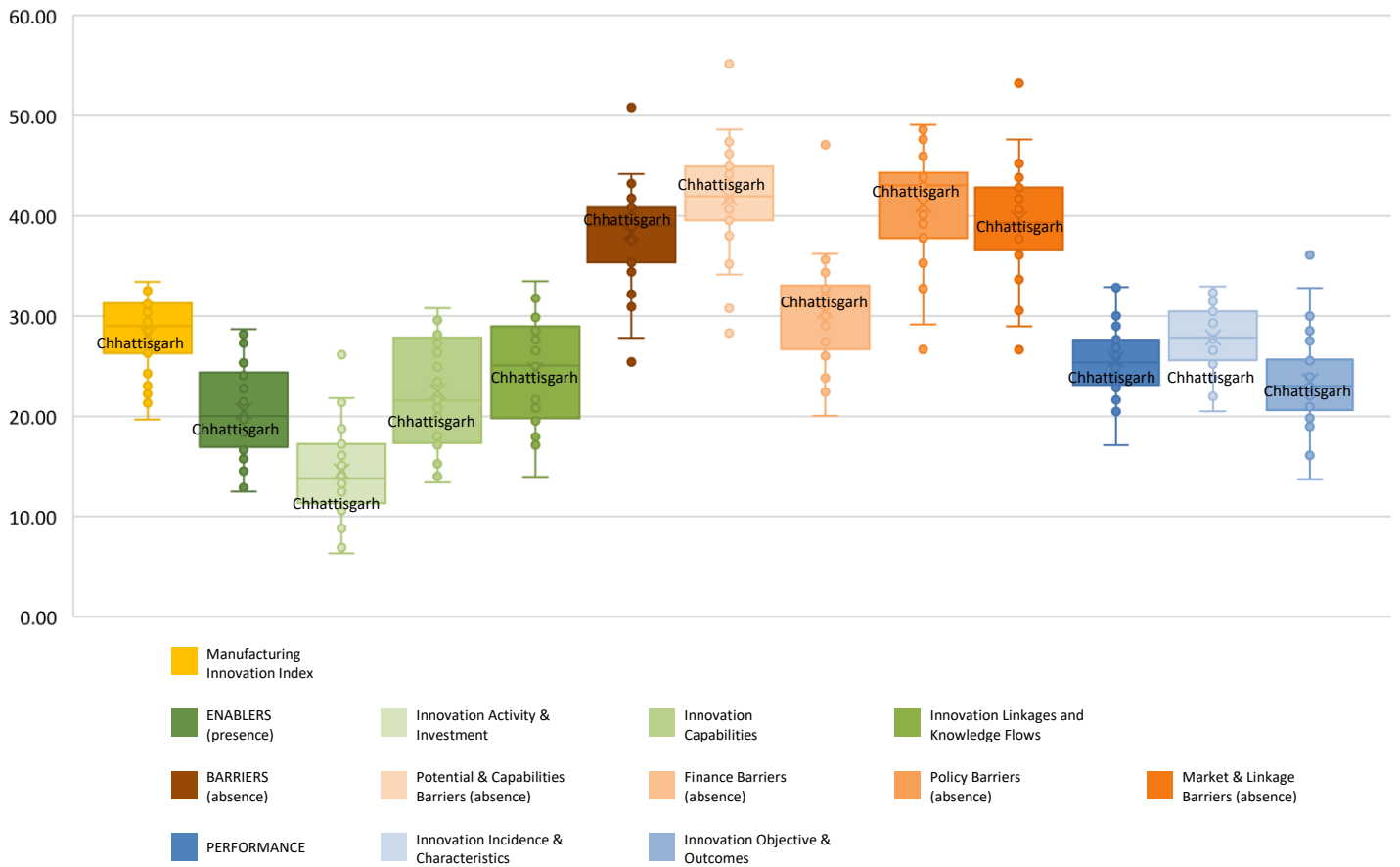
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

27.02

Peer Group Performance

•

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	18.39	•	17	10	Barriers (absence)	39.55	•	13	8	Performance	23.12	•	21	13

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	11.07	•	23	15
1.1	Firms engaging in tangible innovation input activities	6.83	•	16	10
1.2	Firms engaging in knowledge-based capital (intangible) activities	9.01	•	24	15
1.3	Firms investing in tangible activities	10.56	•	23	15
1.4	Firms investing in knowledge-based capital (intangible) activities	17.08	•	20	13

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	19.94	•	18	11
2.1	Firms with internal sources of financing	18.01	•	21	14
2.2	Firms with internal funding available for training	22.36	•	16	9
2.3	Firms with R&D Staff	9.01	•	21	13
2.4	Firms using innovative tools and practices among staff that are successful	8.70	•	22	13
2.5	Firms employing/ engaging experts in advanced digital tools in house	18.63	•	20	13
2.6	Firms employing highly qualified personnel, by level of educational attainment	26.71	•	19	11
2.7	Firms highly satisfied with innovation capabilities of employees	50.31	•	13	9
2.8	Firms using advanced, enabling or emerging technologies	4.04	•	20	13
2.9	Firms making use of internal information sources for innovation	33.33	•	13	9
2.10	Firms with an R&D strategy	12.11	•	18	10
2.11	Firms with an I4.0 strategy	2.80	•	19	11

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	24.15	•	16	10
3.1	Firms highly satisfied with investment climate in the state	51.86	•	16	10
3.2	Firms highly satisfied with ease of doing business in the state	55.28	•	15	9
3.3	Firms highly satisfied with govt. support for enabling innovation	45.34	•	10	6
3.4	Firms highly satisfied with innovation infrastructure in the state	50.62	•	10	6
3.5	Firms highly satisfied with innovation capabilities of external talent pool	29.81	•	17	11
3.6	Firms with formal cooperation agreements	2.80	•	16	9
3.7	Firms with informal cooperation agreements	3.11	•	24	16
3.8	Firms engaging experts in advanced digital tools from external sources	7.14	•	13	7
3.9	Firms selling products in international markets	15.84	•	20	13
3.10	Firms importing from international markets	6.52	•	20	12
3.11	Firms that collaborated with other parties on innovation activities within India	9.94	•	21	14
3.12	Firms that collaborated with other parties on innovation activities from abroad	0.62	•	26	17
3.13	Firms making use of external information sources for innovation	28.88	•	18	14
3.14	Firms with external sources of financing	4.35	•	22	14
3.15	Firms with external funding available for training	3.73	•	4	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	43.46	•	11	8
4.1	Innovation capabilities (R&D, design, etc.) insufficient	39.75	•	7	5
4.2	Organizational rigidities within the firm	45.34	•	11	7
4.3	No need due to prior innovations by this firm	49.38	•	6	4
4.4	Lack of qualified personnel	38.20	•	13	9
4.5	Lack of good ideas for innovations	45.96	•	11	7
4.6	Lack of firm-level infrastructure	42.55	•	15	10

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	32.44	•	10	6
5.1	Lack of funds within the firm or group	28.26	•	11	8
5.2	Lack of finance from sources outside the firm (credit)	33.54	•	8	6
5.3	Excessive perceived risks	36.65	•	10	7
5.4	Innovation costs too high	31.37	•	16	10

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	42.93	•	15	9
6.1	Regulations, standards, taxation	38.82	•	21	14
6.2	Weakness of intellectual property rights	50.00	•	11	6

6.3	Legislative barriers	40.06	•	9	5
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No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	39.34	•	14	9
7.1	Lack of information on markets	39.75	•	14	9
7.2	Deficiencies in the availability of external services	38.20	•	18	11
7.3	Difficulty in finding cooperation partners	40.06	•	18	11
7.4	Lack of information on technology	39.75	•	14	9
7.5	Market dominated by established firms	40.06	•	13	9
7.6	No need due to very little competition in firm's market	51.55	•	8	5
7.7	Uncertain demand for innovative goods or services	35.71	•	17	12
7.8	Low demand for innovations in your market	32.30	•	20	14

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	23.81	•	25	16
8.1	Firms with new or significantly improved goods	5.59	•	25	16
8.2	Firms with new or significantly improved services	1.86	•	21	14
8.3	Share of new-to-market (NTM) product innovators	31.58	•	23	15
8.4	Firms with at least one type of product innovation developed entirely in-house	89.47	•	26	17
8.5	Firms into innovations in operations and product/process development	9.01	•	22	14
8.6	Firms into innovations in marketing and Sales	4.97	•	21	13
8.7	Firms into innovations in procurement, logistics, and distribution	3.42	•	21	13
8.8	Firms into innovations in administration and management	1.86	•	26	17
8.9	Share of new-to-market (NTM) business process innovators	24.14	•	10	5
8.10	Firms with at least one type of business process innovation developed entirely in-house	69.05	•	25	16

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	22.42	•	17	11
Objectives					
9.1	Increase the firm's turnover	26.71	•	13	9
9.2	Increase market presence	28.88	•	13	9
9.3	Reduce costs	22.67	•	14	9
9.4	Product/process enhancement in terms of quality and quantity	21.12	•	17	11
9.5	Reduce environmental impacts	18.63	•	13	8
9.6	Improve health and safety of the firm's employees	16.46	•	18	11
9.7	Meet regulatory requirements (e.g., standards, etc.)	18.94	•	12	7
9.8	Catering to Corporate Social Responsibility	16.15	•	15	10
Outcomes					
9.9	Opened up new market opportunities	12.11	•	24	15
9.10	Responded to existing or forthcoming regulatory provisions	8.39	•	24	16
9.11	Responded to market pressures	11.49	•	24	15
9.12	Responded to cost pressures	12.11	•	23	15
9.13	Improved firm's turnover	13.35	•	23	15
9.14	Firms reporting turnover from new-to-market product innovations	57.89	•	2	2
9.15	Firms reporting turnover from NTM business process innovations	27.59	•	8	4
9.16	Turnover of an innovative firm (% of GSDP per capita)	81.84	•	4	4
9.17	Employment in innovative firms (as a percentage of total employment)	34.92	•	23	15
9.18	Firms that were granted IP rights	9.94	•	26	17
9.19	Firms that attained innovation outcomes through I4.0 technologies	2.80	•	20	12

States in the peer group based on similar GSDP per capita

Jharkhand, Assam, Uttarakhand, Dadra & Nagar Haveli & Daman & Diu, Himachal Pradesh, Jammu & Kashmir

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation



Dadra & Nagar Haveli and Daman & Diu

IMI
Overall
Rank

2

IMI
Score

32.88

Category

UT and City States

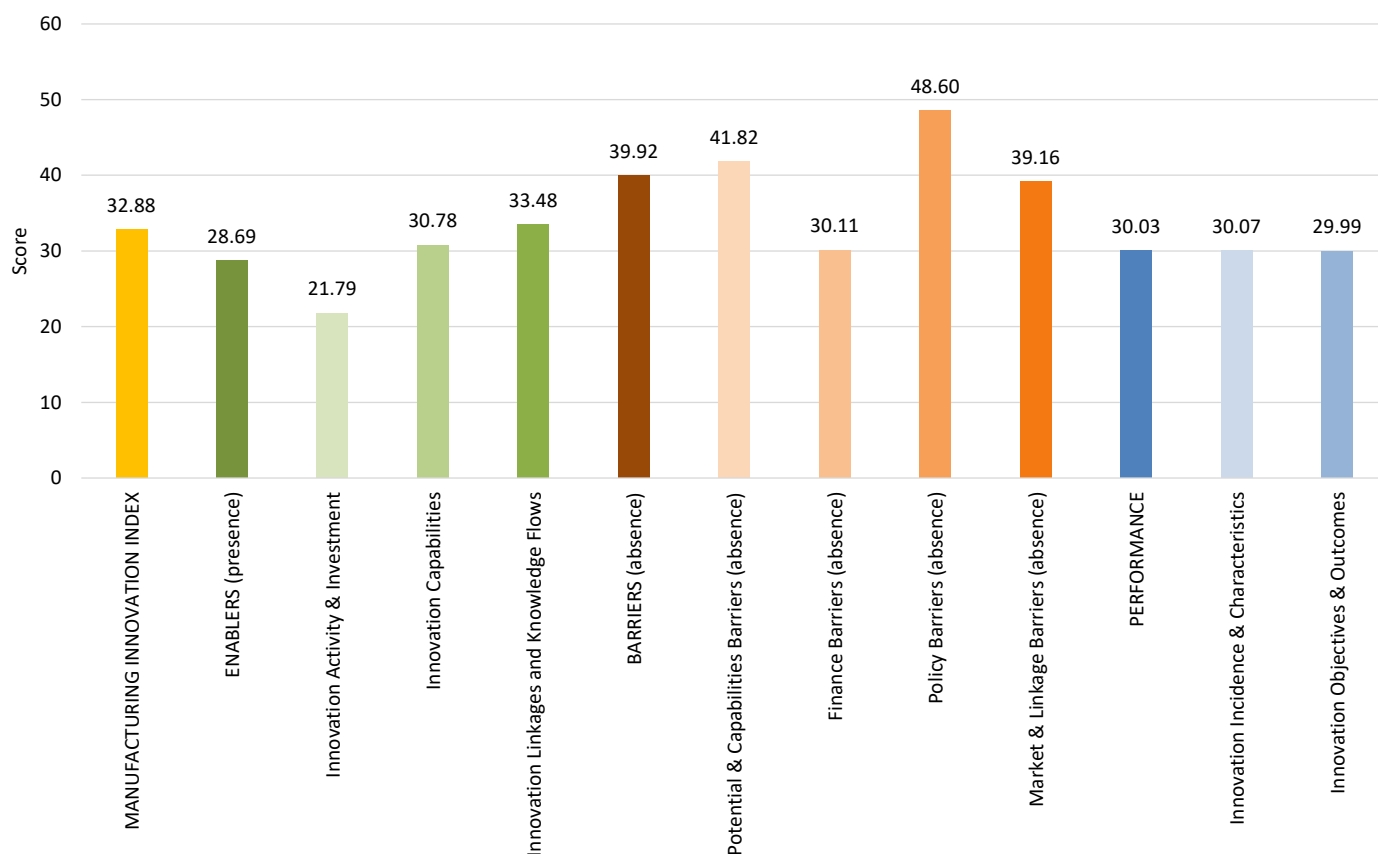
IMI Category Rank

1

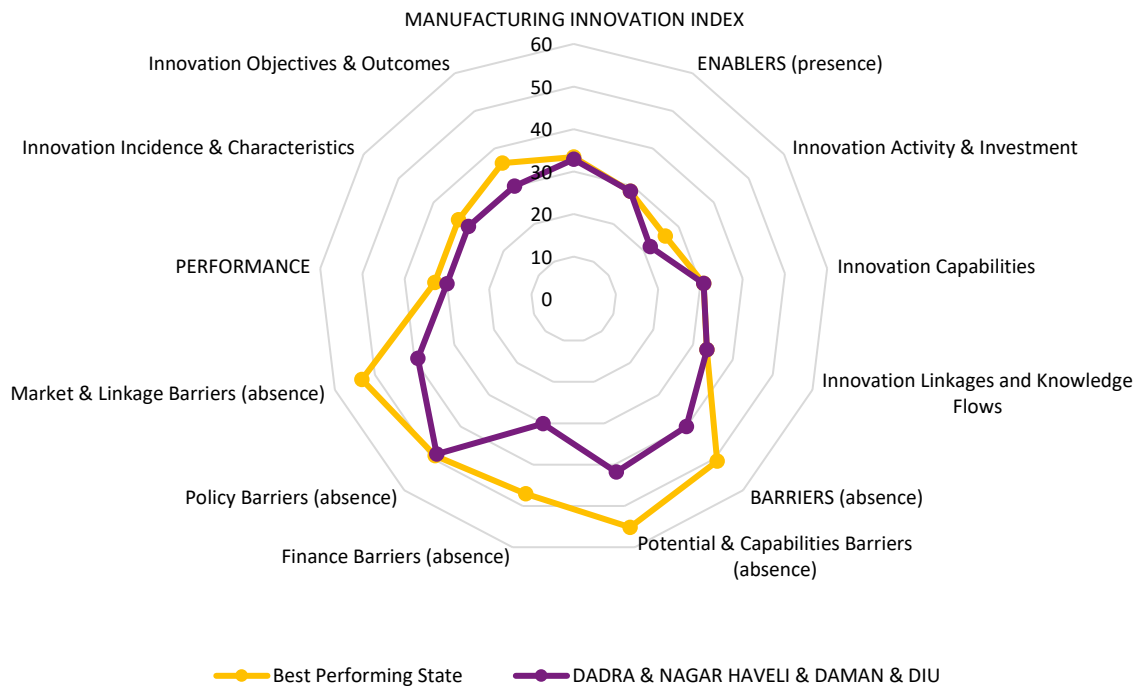
GSDP per capita (INR lakhs)

NA

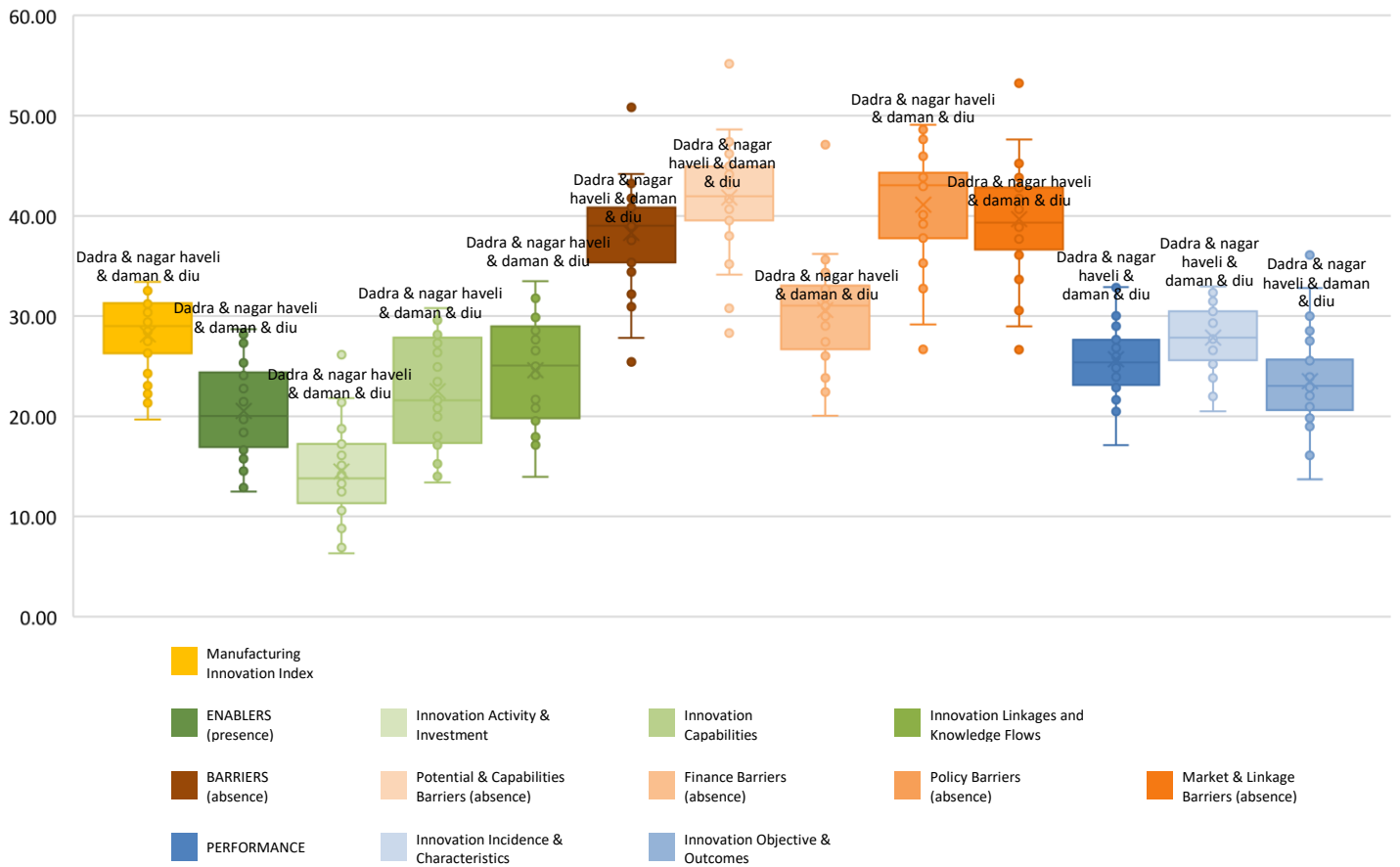
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

32.88

Peer Group Performance

•

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	28.69	•	1	1	Barriers (absence)	39.92	•	12	3	Performance	30.03	•	4	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	21.79	•	19	14
1.1	Firms engaging in tangible innovation input activities	12.62	•	2	2
1.2	Firms engaging in knowledge-based capital (intangible) activities	18.81	•	21	13
1.3	Firms investing in tangible activities	27.86	•	15	9
1.4	Firms investing in knowledge-based capital (intangible) activities	28.57	•	23	15

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	30.78	•	1	1
2.1	Firms with internal sources of financing	32.14	•	2	1
2.2	Firms with internal funding available for training	29.52	•	7	3
2.3	Firms with R&D Staff	20.48	•	1	1
2.4	Firms using innovative tools and practices among staff that are successful	20.00	•	3	1
2.5	Firms employing/ engaging experts in advanced digital tools in house	29.76	•	6	4
2.6	Firms employing highly qualified personnel, by level of educational attainment	30.95	•	11	4
2.7	Firms highly satisfied with innovation capabilities of employees	66.43	•	1	1
2.8	Firms using advanced, enabling or emerging technologies	9.29	•	4	2
2.9	Firms making use of internal information sources for innovation	57.62	•	1	1
2.10	Firms with an R&D strategy	24.29	•	2	1
2.11	Firms with an I4.0 strategy	4.76	•	9	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	33.48	•	1	1
3.1	Firms highly satisfied with investment climate in the state	72.14	•	1	1
3.2	Firms highly satisfied with ease of doing business in the state	75.95	•	1	1
3.3	Firms highly satisfied with govt. support for enabling innovation	58.10	•	1	1
3.4	Firms highly satisfied with innovation infrastructure in the state	60.00	•	1	1
3.5	Firms highly satisfied with innovation capabilities of external talent pool	42.86	•	1	1
3.6	Firms with formal cooperation agreements	8.57	•	1	1
3.7	Firms with informal cooperation agreements	4.29	•	19	4
3.8	Firms engaging experts in advanced digital tools from external sources	12.38	•	2	1
3.9	Firms selling products in international markets	25.71	•	8	1
3.10	Firms importing from international markets	11.43	•	9	3
3.11	Firms that collaborated with other parties on innovation activities within India	17.14	•	7	3
3.12	Firms that collaborated with other parties on innovation activities from abroad	5.71	•	5	2
3.13	Firms making use of external information sources for innovation	49.76	•	2	1
3.14	Firms with external sources of financing	7.14	•	8	2
3.15	Firms with external funding available for training	0.71	•	25	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	41.82	•	15	3
4.1	Innovation capabilities (R&D, design, etc.) insufficient	38.10	•	12	2
4.2	Organizational rigidities within the firm	44.76	•	13	2
4.3	No need due to prior innovations by this firm	43.81	•	20	4
4.4	Lack of qualified personnel	36.19	•	18	4
4.5	Lack of good ideas for innovations	43.81	•	17	3
4.6	Lack of firm-level infrastructure	44.05	•	12	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	30.11	•	16	3
5.1	Lack of funds within the firm or group	25.24	•	15	3
5.2	Lack of finance from sources outside the firm (credit)	28.10	•	19	4
5.3	Excessive perceived risks	35.24	•	15	3
5.4	Innovation costs too high	31.67	•	12	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	48.60	•	2	1
6.1	Regulations, standards, taxation	43.33	•	10	2

6.2	Weakness of intellectual property rights	51.90	•	5	2
6.3	Legislative barriers	50.48	•	1	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	39.16	•	15	3
7.1	Lack of information on markets	39.76	•	13	2
7.2	Deficiencies in the availability of external services	41.67	•	7	2
7.3	Difficulty in finding cooperation partners	43.81	•	11	2
7.4	Lack of information on technology	38.81	•	16	4
7.5	Market dominated by established firms	37.38	•	17	3
7.6	No need due to very little competition in firm's market	50.71	•	10	2
7.7	Uncertain demand for innovative goods or services	33.33	•	22	4
7.8	Low demand for innovations in your market	29.05	•	22	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	30.07	•	8	3
8.1	Firms with new or significantly improved goods	16.67	•	7	2
8.2	Firms with new or significantly improved services	3.10	•	15	5
8.3	Share of new-to-market (NTM) product innovators	52.05	•	7	2
8.4	Firms with at least one type of product innovation developed entirely in-house	90.41	•	25	5
8.5	Firms into innovations in operations and product/process development	11.90	•	13	2
8.6	Firms into innovations in marketing and Sales	9.05	•	5	2
8.7	Firms into innovations in procurement, logistics, and distribution	8.33	•	2	1
8.8	Firms into innovations in administration and management	6.19	•	4	2
8.9	Share of new-to-market (NTM) business process innovators	26.00	•	7	2
8.10	Firms with at least one type of business process innovation developed entirely in-house	86.11	•	7	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	29.99	•	3	1
Objectives					
9.1	Increase the firm's turnover	43.33	•	2	1
9.2	Increase market presence	46.43	•	2	1
9.3	Reduce costs	39.05	•	2	1
9.4	Product/process enhancement in terms of quality and quantity	34.29	•	2	1
9.5	Reduce environmental impacts	25.95	•	4	1
9.6	Improve health and safety of the firm's employees	24.29	•	5	2
9.7	Meet regulatory requirements (e.g., standards, etc.)	20.24	•	9	3
9.8	Catering to Corporate Social Responsibility	17.62	•	10	3
Outcomes					
9.9	Opened up new market opportunities	24.29	•	6	1
9.10	Responded to existing or forthcoming regulatory provisions	11.67	•	17	5
9.11	Responded to market pressures	24.05	•	5	1
9.12	Responded to cost pressures	21.43	•	6	1
9.13	Improved firm's turnover	26.19	•	5	1
9.14	Firms reporting turnover from new-to-market product innovations	50.68	•	6	1
9.15	Firms reporting turnover from NTM business process innovations	30.00	•	4	1
9.16	Turnover of an innovative firm (% of GSDP per capita)	45.65	•	13	2
9.17	Employment in innovative firms (as a percentage of total employment)	55.68	•	2	1
9.18	Firms that were granted IP rights	12.62	•	21	5
9.19	Firms that attained innovation outcomes through I4.0 technologies	8.81	•	3	2

States in the peer group based on similar GSDP per capita

Himachal Pradesh, Jammu & Kashmir, Uttarakhand, Assam, Jharkhand, Chhattisgarh

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation

Goa

IMI
Overall
Rank

12

IMI
Score

29.77

Category

UT and City States

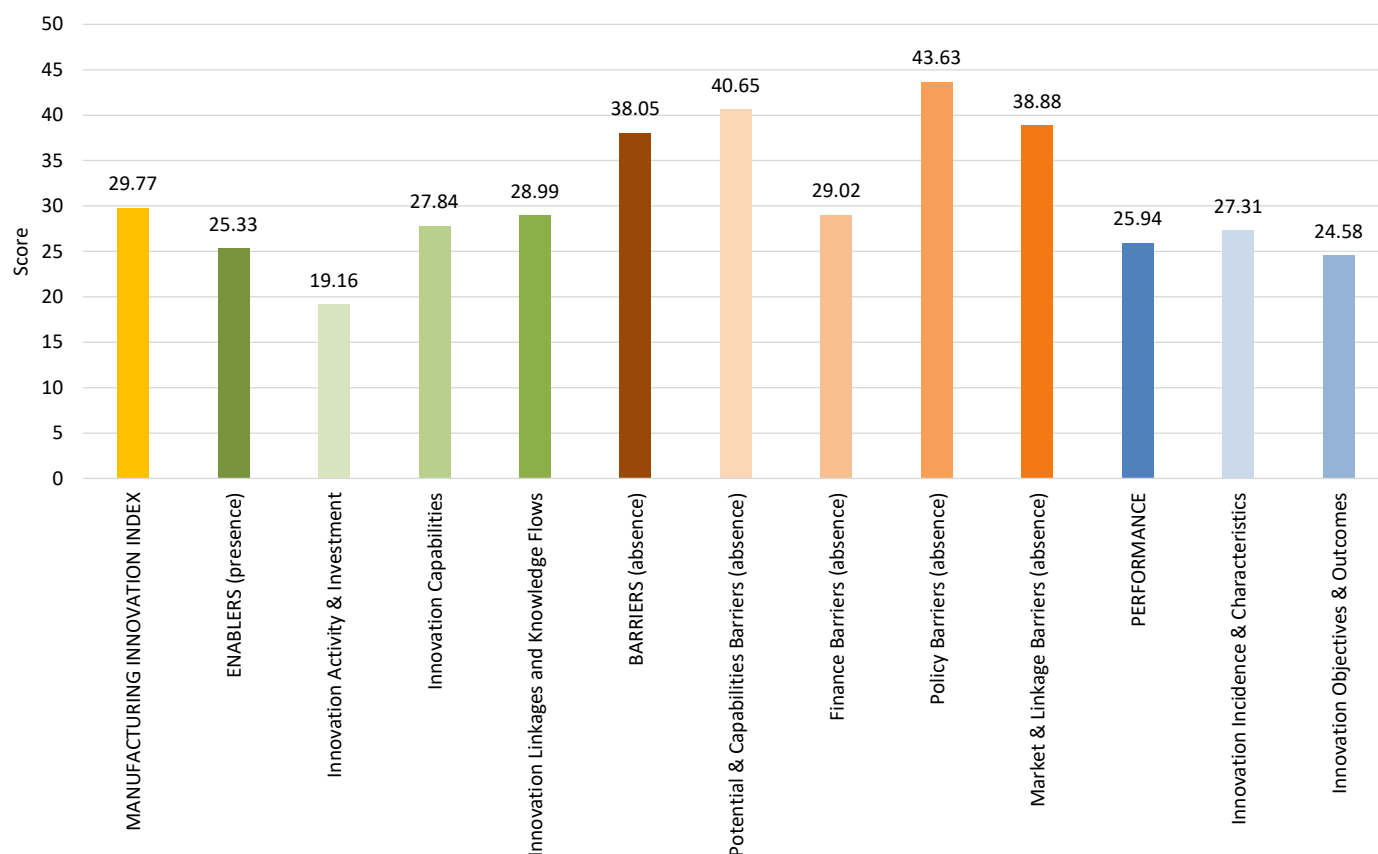
IMI Category Rank

4

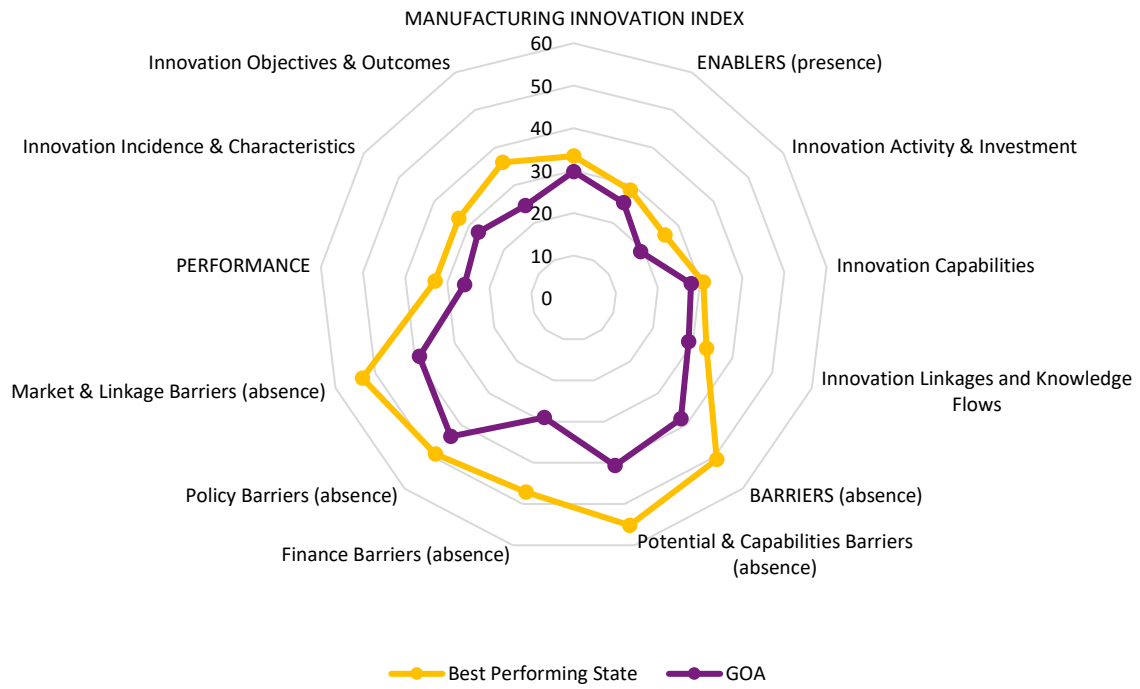
GSDP per capita (INR lakhs)

3.13

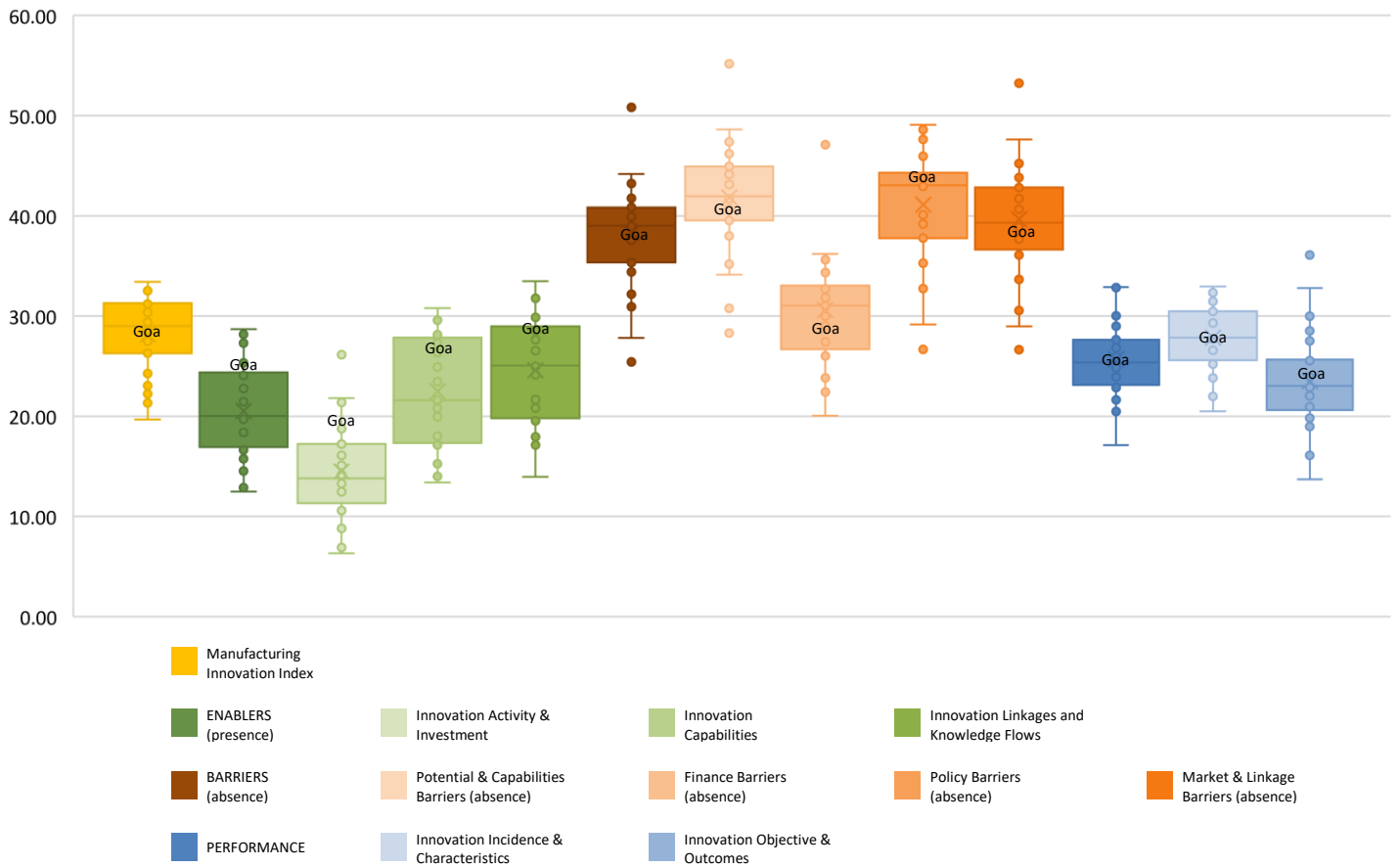
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMIII Score	29.77
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Peer Group Performance	●
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Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	25.33	●	6	2	Barriers (absence)	38.05	●	17	4	Performance	25.94	●	13	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1 Innovation Activity & Investment		19.16	●	4	2
1.1	Firms engaging in tangible innovation input activities	9.14	●	10	2
1.2	Firms engaging in knowledge-based capital (intangible) activities	20.00	●	4	1
1.3	Firms investing in tangible activities	18.29	●	5	2
1.4	Firms investing in knowledge-based capital (intangible) activities	28.57	●	4	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2 Innovation Capabilities		27.84	●	7	3
2.1	Firms with internal sources of financing	26.29	●	6	2
2.2	Firms with internal funding available for training	32.00	●	3	2
2.3	Firms with R&D Staff	17.71	●	5	3
2.4	Firms using innovative tools and practices among staff that are successful	15.43	●	10	3
2.5	Firms employing/ engaging experts in advanced digital tools in house	34.29	●	2	1
2.6	Firms employing highly qualified personnel, by level of educational attainment	35.43	●	6	3
2.7	Firms highly satisfied with innovation capabilities of employees	57.14	●	7	2
2.8	Firms using advanced, enabling or emerging technologies	8.00	●	8	4
2.9	Firms making use of internal information sources for innovation	42.86	●	7	3
2.10	Firms with an R&D strategy	18.86	●	8	3
2.11	Firms with an I4.0 strategy	6.29	●	4	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3 Innovation Linkages and Knowledge Flows		28.99	●	7	3
3.1	Firms highly satisfied with investment climate in the state	56.00	●	11	4
3.2	Firms highly satisfied with ease of doing business in the state	62.86	●	7	4
3.3	Firms highly satisfied with govt. support for enabling innovation	47.43	●	7	3
3.4	Firms highly satisfied with innovation infrastructure in the state	53.71	●	7	3
3.5	Firms highly satisfied with innovation capabilities of external talent pool	39.43	●	6	3
3.6	Firms with formal cooperation agreements	4.00	●	11	4
3.7	Firms with informal cooperation agreements	6.29	●	7	2
3.8	Firms engaging experts in advanced digital tools from external sources	12.00	●	3	2
3.9	Firms selling products in international markets	25.71	●	9	2
3.10	Firms importing from international markets	13.14	●	7	2
3.11	Firms that collaborated with other parties on innovation activities within India	19.43	●	4	1
3.12	Firms that collaborated with other parties on innovation activities from abroad	6.86	●	1	1
3.13	Firms making use of external information sources for innovation	36.57	●	6	2
3.14	Firms with external sources of financing	6.86	●	11	3
3.15	Firms with external funding available for training	2.86	●	10	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4 Potential & Capabilities Barriers Pillar Score		40.65	●	19	4
4.1	Innovation capabilities (R&D, design, etc.) insufficient	36.00	●	20	4
4.2	Organizational rigidities within the firm	43.43	●	17	3
4.3	No need due to prior innovations by this firm	45.71	●	15	3
4.4	Lack of qualified personnel	37.14	●	15	3
4.5	Lack of good ideas for innovations	43.43	●	19	4
4.6	Lack of firm-level infrastructure	38.86	●	20	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5 Finance Barriers Pillar Score		29.02	●	18	4
5.1	Lack of funds within the firm or group	24.57	●	16	4
5.2	Lack of finance from sources outside the firm (credit)	31.43	●	12	3
5.3	Excessive perceived risks	32.00	●	17	4
5.4	Innovation costs too high	28.57	●	18	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6 Policy Barriers Pillar Score		43.63	●	11	4
6.1	Regulations, standards, taxation	40.00	●	18	4

6.2	Weakness of intellectual property rights	46.29	●	17	4
6.3	Legislative barriers	44.57	●	4	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7 Market & Linkage Barriers Pillar Score		38.88	●	17	4
7.1	Lack of information on markets	38.86	●	15	3
7.2	Deficiencies in the availability of external services	38.29	●	17	4
7.3	Difficulty in finding cooperation partners	43.43	●	12	3
7.4	Lack of information on technology	40.00	●	13	2
7.5	Market dominated by established firms	37.14	●	18	4
7.6	No need due to very little competition in firm's market	46.29	●	19	4
7.7	Uncertain demand for innovative goods or services	34.29	●	21	3
7.8	Low demand for innovations in your market	33.14	●	18	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8 Innovation Incidence & Characteristics		27.31	●	16	4
8.1	Firms with new or significantly improved goods	15.43	●	11	3
8.2	Firms with new or significantly improved services	6.86	●	3	1
8.3	Share of new-to-market (NTM) product innovators	34.38	●	20	4
8.4	Firms with at least one type of product innovation developed entirely in-house	100.00	●	5	2
8.5	Firms into innovations in operations and product/process development	14.29	●	8	1
8.6	Firms into innovations in marketing and Sales	8.57	●	7	3
8.7	Firms into innovations in procurement, logistics, and distribution	5.14	●	11	4
8.8	Firms into innovations in administration and management	4.57	●	12	4
8.9	Share of new-to-market (NTM) business process innovators	12.00	●	23	5
8.10	Firms with at least one type of business process innovation developed entirely in-house	80.00	●	15	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9 Innovation Objectives & Outcomes		24.58	●	9	2
Objectives					
9.1	Increase the firm's turnover	33.71	●	6	2
9.2	Increase market presence	37.71	●	4	2
9.3	Reduce costs	31.43	●	5	2
9.4	Product/process enhancement in terms of quality and quantity	29.14	●	8	2
9.5	Reduce environmental impacts	24.00	●	6	2
9.6	Improve health and safety of the firm's employees	25.14	●	3	1
9.7	Meet regulatory requirements (e.g., standards, etc.)	26.86	●	3	1
9.8	Catering to Corporate Social Responsibility	23.43	●	3	1
Outcomes					
9.9	Opened up new market opportunities	23.43	●	8	2
9.10	Responded to existing or forthcoming regulatory provisions	15.43	●	10	2
9.11	Responded to market pressures	18.86	●	12	4
9.12	Responded to cost pressures	21.14	●	7	2
9.13	Improved firm's turnover	23.43	●	8	2
9.14	Firms reporting turnover from new-to-market product innovations	31.25	●	22	5
9.15	Firms reporting turnover from NTM business process innovations	8.00	●	25	5
9.16	Turnover of an innovative firm (% of GSDP per capita)	13.35	●	27	5
9.17	Employment in innovative firms (as a percentage of total employment)	39.05	●	18	3
9.18	Firms that were granted IP rights	18.86	●	13	3
9.19	Firms that attained innovation outcomes through I4.0 technologies	3.43	●	17	5

States in the peer group based on similar GSDP per capita Chandigarh, Puducherry, Ner States, Dadra & Nagar Haveli & Daman & Diu, Himachal Pradesh, Jammu & Kashmir

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation



Gujarat

IMI
Overall
Rank

11

IMI
Score

30.37

Category

Major States

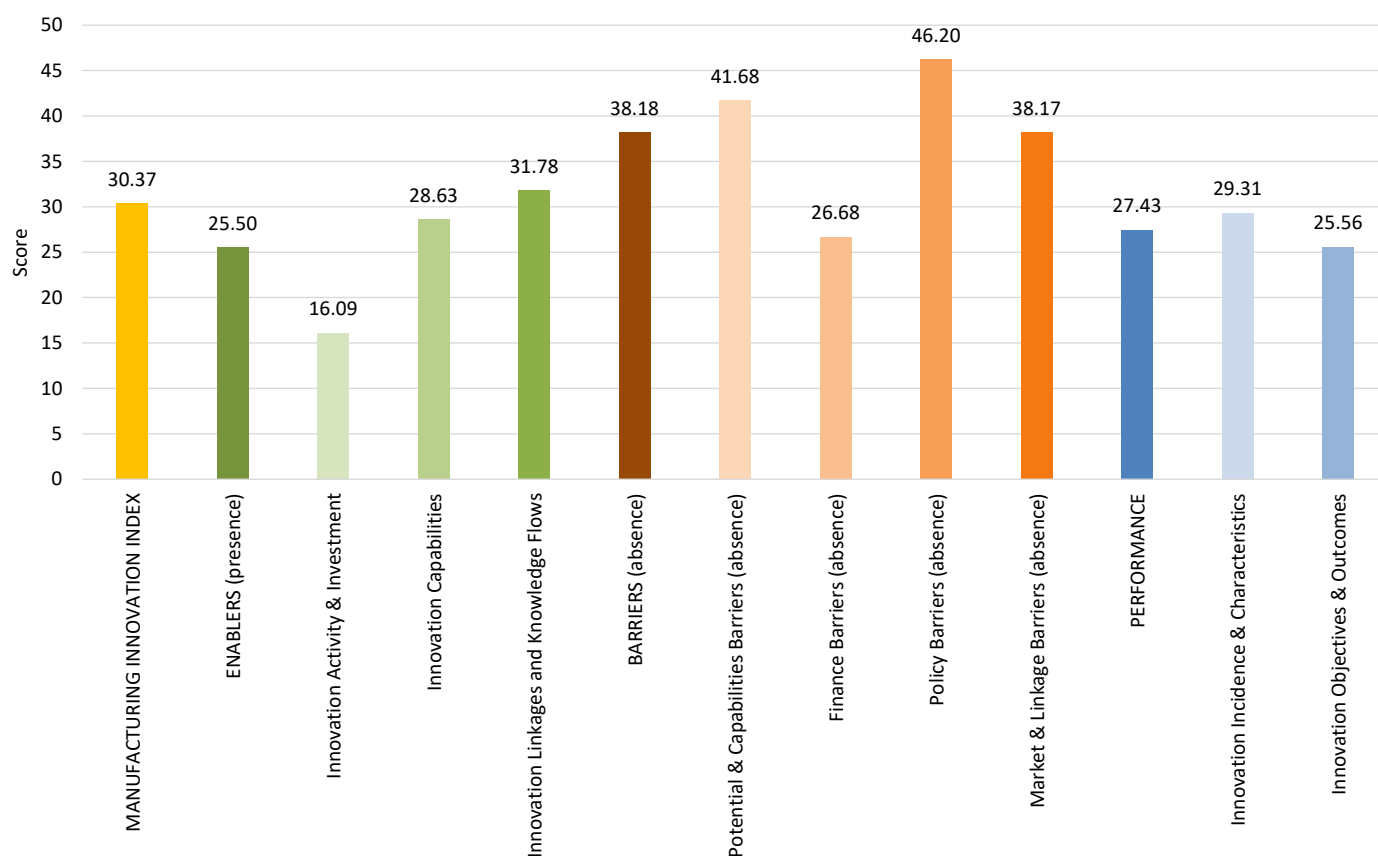
IMI Category Rank

6

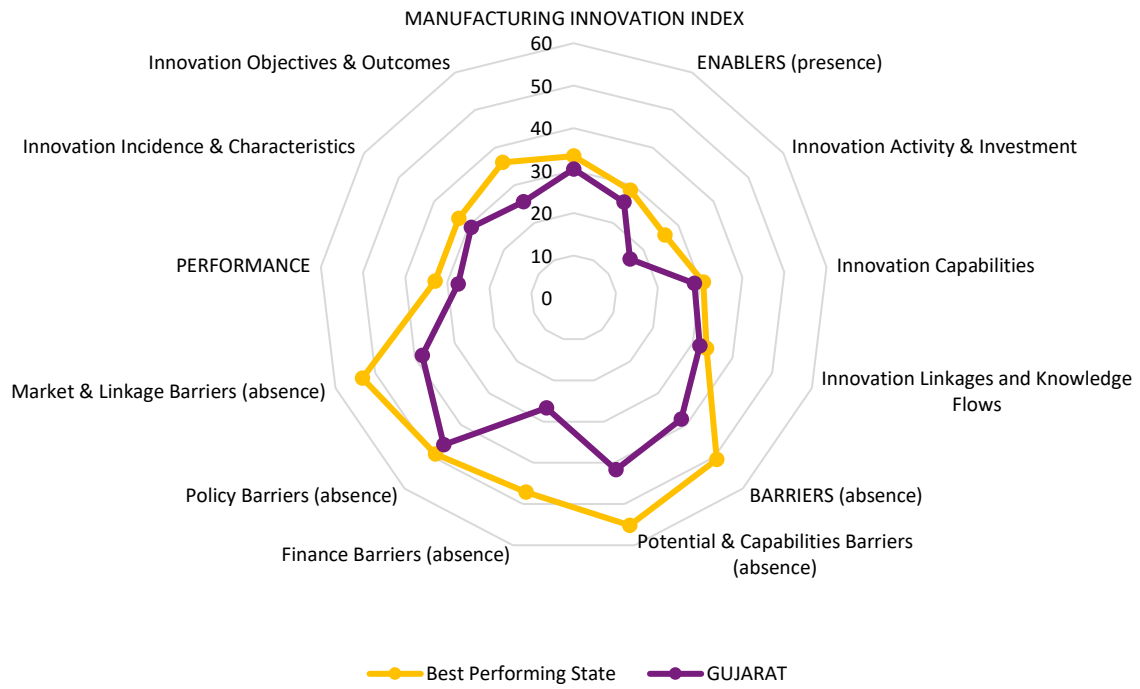
GSDP per capita (INR lakhs)

1.64

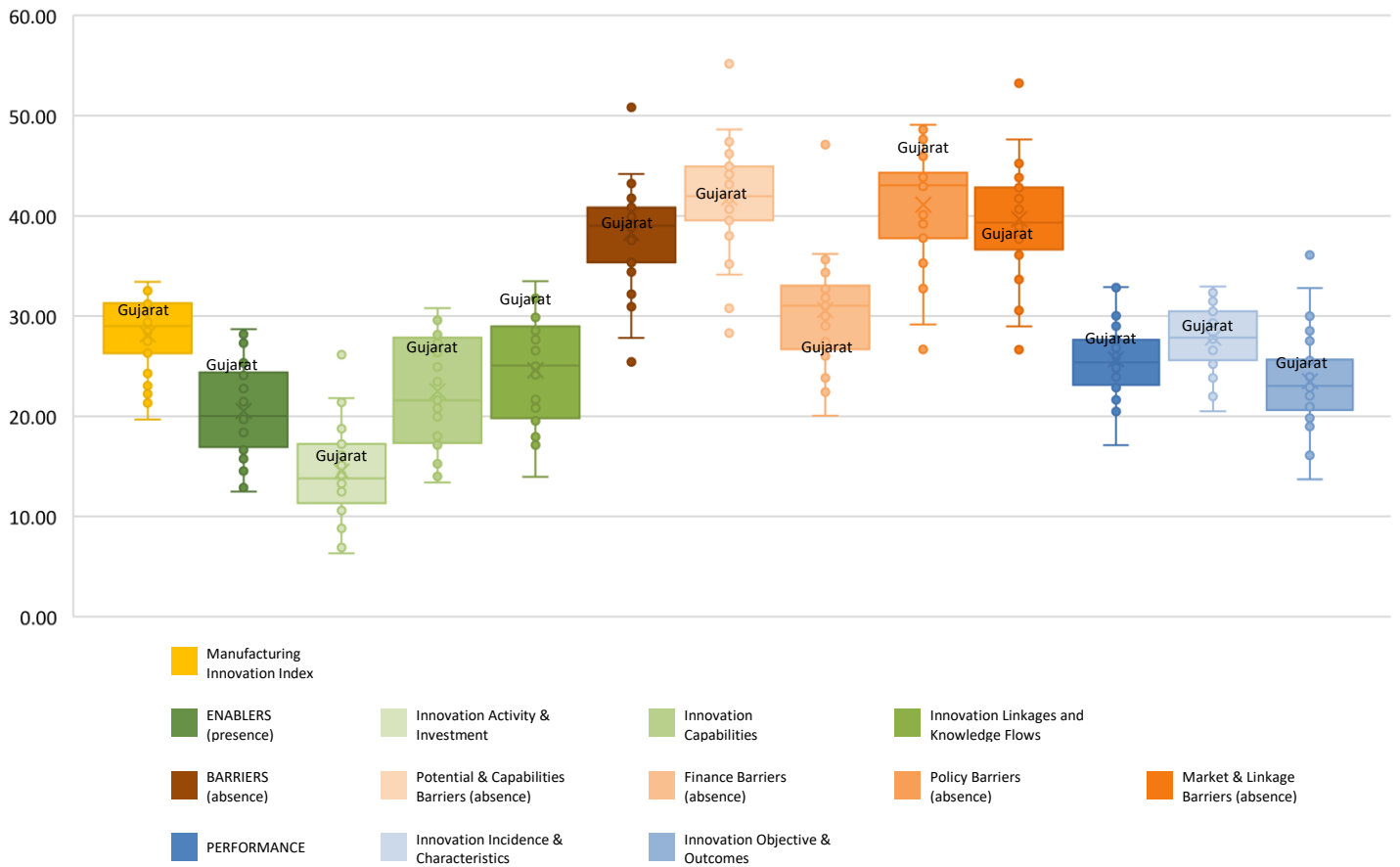
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

30.37

Peer Group Performance

•

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	25.50	•	5	4	Barriers (absence)	38.18	•	16	10	Performance	27.43	•	9	6

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	16.09	•	9	6
1.1	Firms engaging in tangible innovation input activities	6.19	•	21	13
1.2	Firms engaging in knowledge-based capital (intangible) activities	13.86	•	10	6
1.3	Firms investing in tangible activities	14.36	•	14	8
1.4	Firms investing in knowledge-based capital (intangible) activities	28.47	•	5	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	28.63	•	5	4
2.1	Firms with internal sources of financing	30.20	•	4	3
2.2	Firms with internal funding available for training	26.49	•	12	6
2.3	Firms with R&D Staff	14.60	•	9	3
2.4	Firms using innovative tools and practices among staff that are successful	15.59	•	9	6
2.5	Firms employing/ engaging experts in advanced digital tools in house	28.96	•	8	4
2.6	Firms employing highly qualified personnel, by level of educational attainment	35.40	•	7	3
2.7	Firms highly satisfied with innovation capabilities of employees	62.87	•	2	1
2.8	Firms using advanced, enabling or emerging technologies	7.43	•	9	5
2.9	Firms making use of internal information sources for innovation	51.24	•	2	1
2.10	Firms with an R&D strategy	24.50	•	1	1
2.11	Firms with an I4.0 strategy	3.47	•	13	6

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	31.78	•	2	1
3.1	Firms highly satisfied with investment climate in the state	68.07	•	2	1
3.2	Firms highly satisfied with ease of doing business in the state	69.80	•	2	1
3.3	Firms highly satisfied with govt. support for enabling innovation	55.20	•	2	1
3.4	Firms highly satisfied with innovation infrastructure in the state	58.91	•	2	1
3.5	Firms highly satisfied with innovation capabilities of external talent pool	40.35	•	4	3
3.6	Firms with formal cooperation agreements	4.21	•	10	5
3.7	Firms with informal cooperation agreements	7.18	•	3	3
3.8	Firms engaging experts in advanced digital tools from external sources	10.40	•	8	5
3.9	Firms selling products in international markets	30.69	•	2	2
3.10	Firms importing from international markets	8.66	•	13	6
3.11	Firms that collaborated with other parties on innovation activities within India	19.55	•	3	3
3.12	Firms that collaborated with other parties on innovation activities from abroad	5.45	•	8	5
3.13	Firms making use of external information sources for innovation	39.36	•	4	3
3.14	Firms with external sources of financing	4.21	•	23	15
3.15	Firms with external funding available for training	2.48	•	13	11

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	41.68	•	16	10
4.1	Innovation capabilities (R&D, design, etc.) insufficient	35.15	•	21	14
4.2	Organizational rigidities within the firm	42.33	•	19	12
4.3	No need due to prior innovations by this firm	49.01	•	7	5
4.4	Lack of qualified personnel	34.16	•	24	16
4.5	Lack of good ideas for innovations	45.05	•	16	11
4.6	Lack of firm-level infrastructure	44.55	•	10	6

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	26.68	•	21	14
5.1	Lack of funds within the firm or group	20.79	•	24	17
5.2	Lack of finance from sources outside the firm (credit)	27.97	•	20	13
5.3	Excessive perceived risks	30.94	•	21	14
5.4	Innovation costs too high	27.48	•	21	14

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	46.20	•	5	2
6.1	Regulations, standards, taxation	44.06	•	8	5

6.2	Weakness of intellectual property rights	48.76	•	14	9
6.3	Legislative barriers	45.79	•	3	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	38.17	•	19	12
7.1	Lack of information on markets	38.12	•	19	12
7.2	Deficiencies in the availability of external services	37.38	•	19	12
7.3	Difficulty in finding cooperation partners	39.60	•	20	13
7.4	Lack of information on technology	35.89	•	23	16
7.5	Market dominated by established firms	36.88	•	19	12
7.6	No need due to very little competition in firm's market	50.00	•	12	7
7.7	Uncertain demand for innovative goods or services	34.41	•	20	15
7.8	Low demand for innovations in your market	34.90	•	16	12

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	29.31	•	12	7
8.1	Firms with new or significantly improved goods	16.34	•	9	6
8.2	Firms with new or significantly improved services	3.47	•	12	7
8.3	Share of new-to-market (NTM) product innovators	47.83	•	11	7
8.4	Firms with at least one type of product innovation developed entirely in-house	98.55	•	9	5
8.5	Firms into innovations in operations and product/process development	9.16	•	20	12
8.6	Firms into innovations in marketing and Sales	7.43	•	8	4
8.7	Firms into innovations in procurement, logistics, and distribution	4.95	•	12	8
8.8	Firms into innovations in administration and management	2.97	•	23	15
8.9	Share of new-to-market (NTM) business process innovators	21.62	•	12	7
8.10	Firms with at least one type of business process innovation developed entirely in-house	90.74	•	3	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	25.56	•	8	6
Objectives					
9.1	Increase the firm's turnover	36.39	•	4	3
9.2	Increase market presence	37.62	•	5	3
9.3	Reduce costs	31.93	•	4	3
9.4	Product/process enhancement in terms of quality and quantity	33.17	•	4	3
9.5	Reduce environmental impacts	23.02	•	9	5
9.6	Improve health and safety of the firm's employees	23.27	•	8	5
9.7	Meet regulatory requirements (e.g., standards, etc.)	24.01	•	4	3
9.8	Catering to Corporate Social Responsibility	20.54	•	7	5
Outcomes					
9.9	Opened up new market opportunities	20.79	•	11	7
9.10	Responded to existing or forthcoming regulatory provisions	11.88	•	16	10
9.11	Responded to market pressures	18.56	•	14	8
9.12	Responded to cost pressures	13.86	•	19	12
9.13	Improved firm's turnover	21.53	•	11	7
9.14	Firms reporting turnover from new-to-market product innovations	43.48	•	12	10
9.15	Firms reporting turnover from NTM business process innovations	21.62	•	18	11
9.16	Turnover of an innovative firm (% of GSDP per capita)	27.44	•	24	18
9.17	Employment in innovative firms (as a percentage of total employment)	36.05	•	22	14
9.18	Firms that were granted IP rights	19.06	•	12	8
9.19	Firms that attained innovation outcomes through I4.0 technologies	5.94	•	9	6

States in the peer group based on similar GSDP per capita

Tamil Nadu, Uttar Pradesh, Karnataka, West Bengal, Rajasthan, Andhra Pradesh

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation



Haryana

IMI
Overall
Rank

10

IMI
Score

30.47

Category

Major States

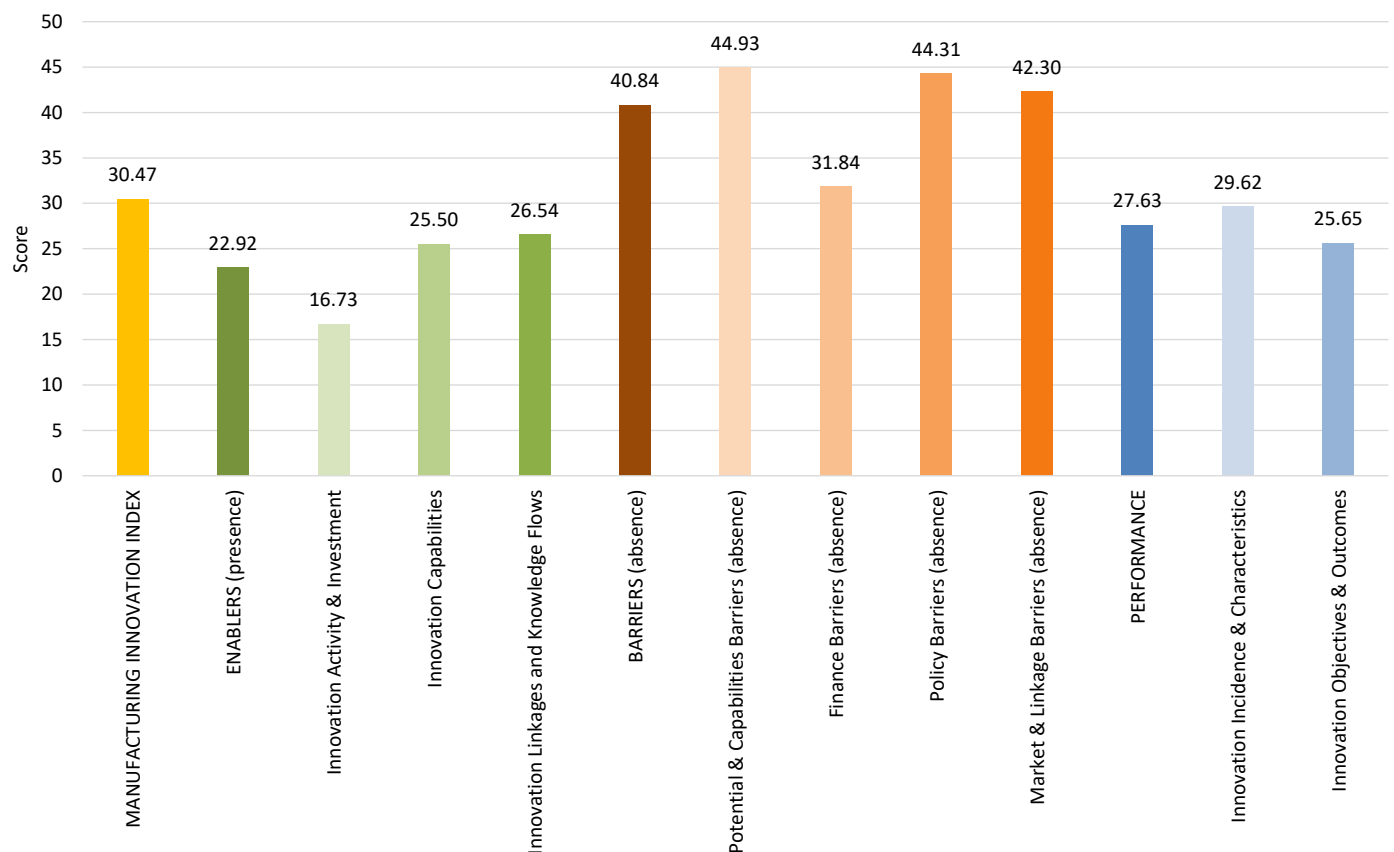
IMI Category Rank

5

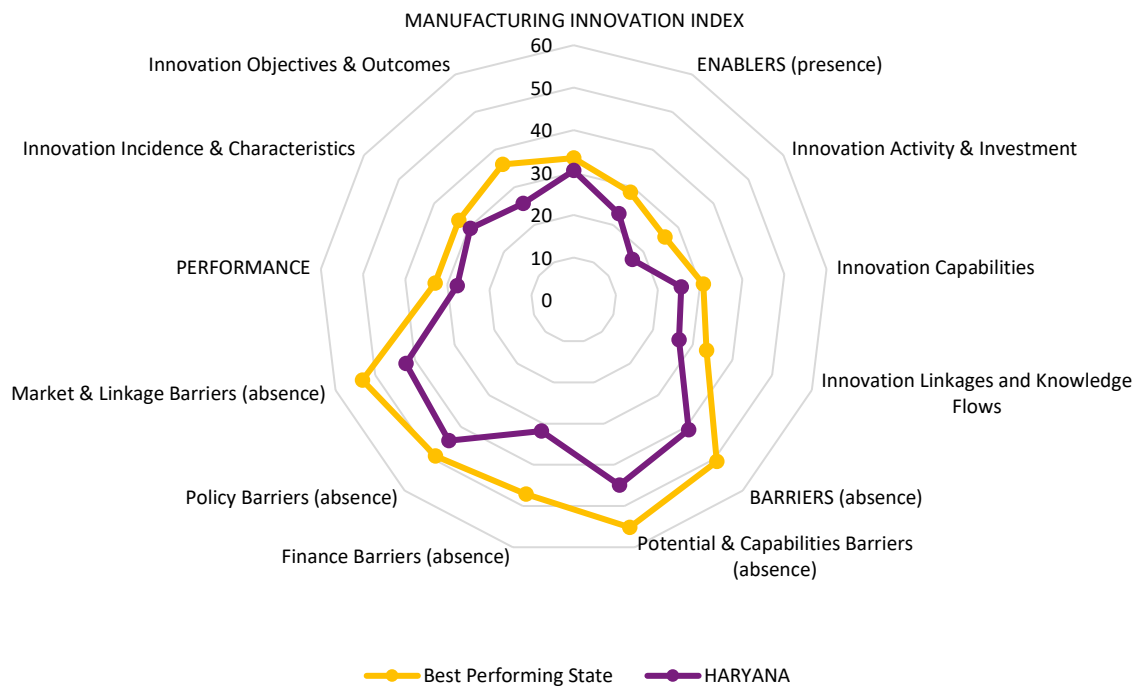
GSDP per capita (INR lakhs)

1.77

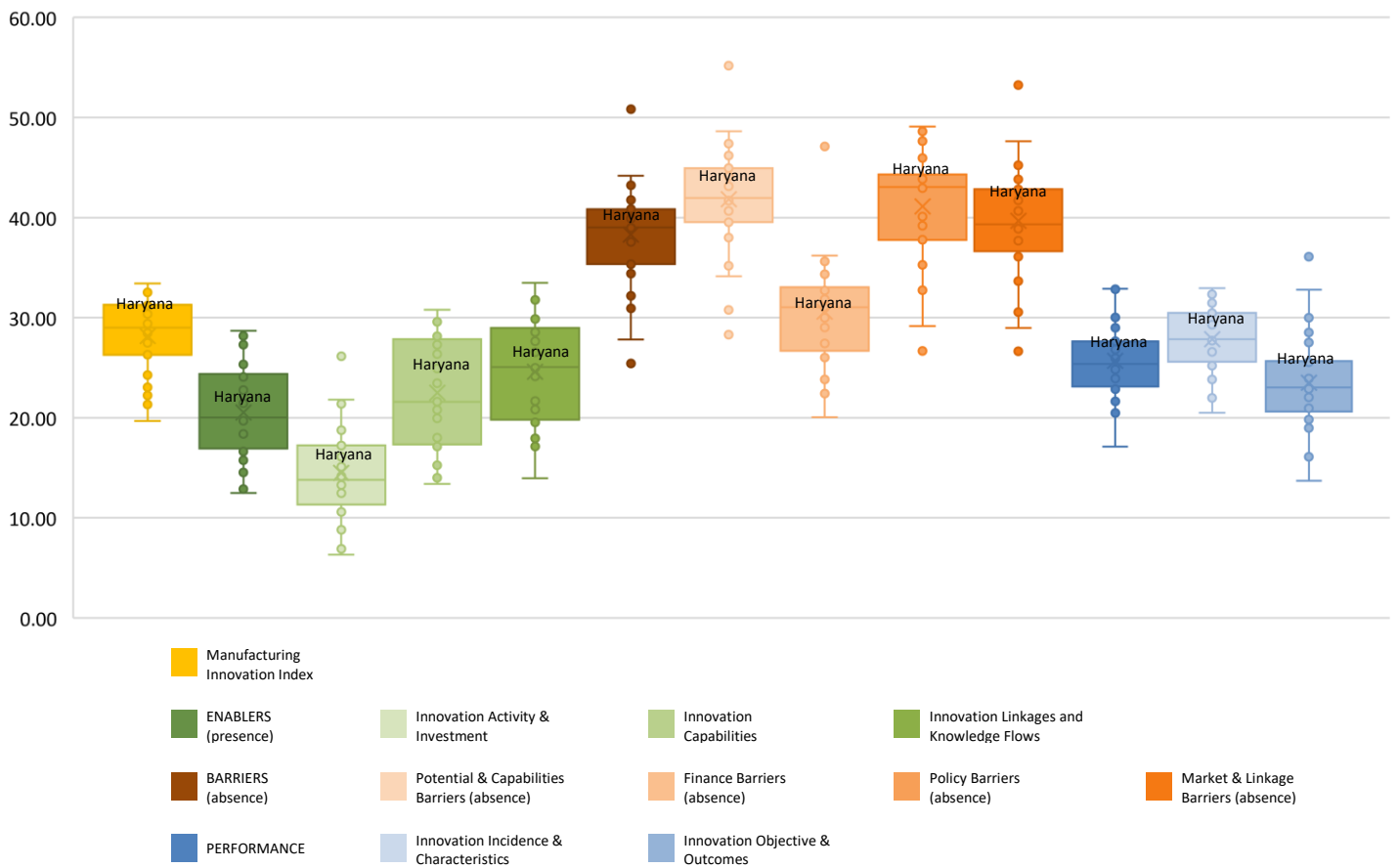
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

30.47

Peer Group Performance

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Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	22.92	•	10	6	Barriers (absence)	40.84	•	7	4	Performance	27.63	•	7	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	16.73	•	8	5
1.1	Firms engaging in tangible innovation input activities	9.97	•	7	6
1.2	Firms engaging in knowledge-based capital (intangible) activities	16.42	•	6	4
1.3	Firms investing in tangible activities	17.01	•	6	3
1.4	Firms investing in knowledge-based capital (intangible) activities	23.17	•	11	7

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	25.50	•	11	6
2.1	Firms with internal sources of financing	24.93	•	9	6
2.2	Firms with internal funding available for training	27.86	•	10	4
2.3	Firms with R&D Staff	15.25	•	8	2
2.4	Firms using innovative tools and practices among staff that are successful	17.60	•	5	3
2.5	Firms employing/ engaging experts in advanced digital tools in house	29.33	•	7	3
2.6	Firms employing highly qualified personnel, by level of educational attainment	32.26	•	10	6
2.7	Firms highly satisfied with innovation capabilities of employees	53.08	•	11	7
2.8	Firms using advanced, enabling or emerging technologies	7.33	•	10	6
2.9	Firms making use of internal information sources for innovation	23.33	•	12	8
2.10	Firms with an R&D strategy	17.01	•	10	5
2.11	Firms with an I4.0 strategy	6.16	•	5	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	26.54	•	12	7
3.1	Firms highly satisfied with investment climate in the state	52.79	•	15	9
3.2	Firms highly satisfied with ease of doing business in the state	54.84	•	16	10
3.3	Firms highly satisfied with govt. support for enabling innovation	42.23	•	13	8
3.4	Firms highly satisfied with innovation infrastructure in the state	44.57	•	15	10
3.5	Firms highly satisfied with innovation capabilities of external talent pool	35.19	•	12	6
3.6	Firms with formal cooperation agreements	6.45	•	4	3
3.7	Firms with informal cooperation agreements	5.87	•	9	7
3.8	Firms engaging experts in advanced digital tools from external sources	10.85	•	5	3
3.9	Firms selling products in international markets	29.91	•	5	5
3.10	Firms importing from international markets	13.20	•	6	4
3.11	Firms that collaborated with other parties on innovation activities within India	17.89	•	6	4
3.12	Firms that collaborated with other parties on innovation activities from abroad	6.74	•	2	1
3.13	Firms making use of external information sources for innovation	31.96	•	12	8
3.14	Firms with external sources of financing	7.33	•	6	5
3.15	Firms with external funding available for training	3.52	•	7	7

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	44.93	•	7	5
4.1	Innovation capabilities (R&D, design, etc.) insufficient	38.42	•	11	8
4.2	Organizational rigidities within the firm	47.80	•	5	3
4.3	No need due to prior innovations by this firm	47.51	•	10	8
4.4	Lack of qualified personnel	42.23	•	6	4
4.5	Lack of good ideas for innovations	49.85	•	4	2
4.6	Lack of firm-level infrastructure	44.87	•	9	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	31.84	•	11	7
5.1	Lack of funds within the firm or group	28.45	•	9	6
5.2	Lack of finance from sources outside the firm (credit)	31.96	•	10	7
5.3	Excessive perceived risks	35.48	•	14	9
5.4	Innovation costs too high	31.38	•	15	9

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	44.31	•	7	4
6.1	Regulations, standards, taxation	43.40	•	9	6

6.2	Weakness of intellectual property rights	51.61	•	6	3
6.3	Legislative barriers	38.12	•	11	7

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	42.30	•	9	6
7.1	Lack of information on markets	41.64	•	12	8
7.2	Deficiencies in the availability of external services	39.88	•	12	7
7.3	Difficulty in finding cooperation partners	43.99	•	9	5
7.4	Lack of information on technology	41.35	•	11	7
7.5	Market dominated by established firms	42.82	•	7	4
7.6	No need due to very little competition in firm's market	51.61	•	7	4
7.7	Uncertain demand for innovative goods or services	38.71	•	9	5
7.8	Low demand for innovations in your market	39.88	•	5	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	29.62	•	10	5
8.1	Firms with new or significantly improved goods	16.42	•	8	5
8.2	Firms with new or significantly improved services	2.64	•	16	10
8.3	Share of new-to-market (NTM) product innovators	53.23	•	6	3
8.4	Firms with at least one type of product innovation developed entirely in-house	96.77	•	12	8
8.5	Firms into innovations in operations and product/process development	16.13	•	5	5
8.6	Firms into innovations in marketing and Sales	6.16	•	17	10
8.7	Firms into innovations in procurement, logistics, and distribution	5.87	•	9	6
8.8	Firms into innovations in administration and management	5.28	•	9	4
8.9	Share of new-to-market (NTM) business process innovators	21.82	•	11	6
8.10	Firms with at least one type of business process innovation developed entirely in-house	79.03	•	17	9

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	25.65	•	7	5
Objectives					
9.1	Increase the firm's turnover	29.91	•	9	6
9.2	Increase market presence	30.50	•	9	6
9.3	Reduce costs	25.51	•	10	6
9.4	Product/process enhancement in terms of quality and quantity	24.34	•	13	8
9.5	Reduce environmental impacts	21.41	•	10	6
9.6	Improve health and safety of the firm's employees	20.82	•	10	6
9.7	Meet regulatory requirements (e.g., standards, etc.)	19.06	•	11	6
9.8	Catering to Corporate Social Responsibility	18.18	•	9	6
Outcomes					
9.9	Opened up new market opportunities	23.46	•	7	5
9.10	Responded to existing or forthcoming regulatory provisions	15.84	•	7	5
9.11	Responded to market pressures	22.58	•	7	5
9.12	Responded to cost pressures	21.11	•	8	5
9.13	Improved firm's turnover	24.63	•	7	5
9.14	Firms reporting turnover from new-to-market product innovations	54.84	•	5	4
9.15	Firms reporting turnover from NTM business process innovations	21.82	•	17	10
9.16	Turnover of an innovative firm (% of GSDP per capita)	37.82	•	15	10
9.17	Employment in innovative firms (as a percentage of total employment)	48.28	•	9	7
9.18	Firms that were granted IP rights	21.11	•	7	3
9.19	Firms that attained innovation outcomes through I4.0 technologies	6.45	•	6	4

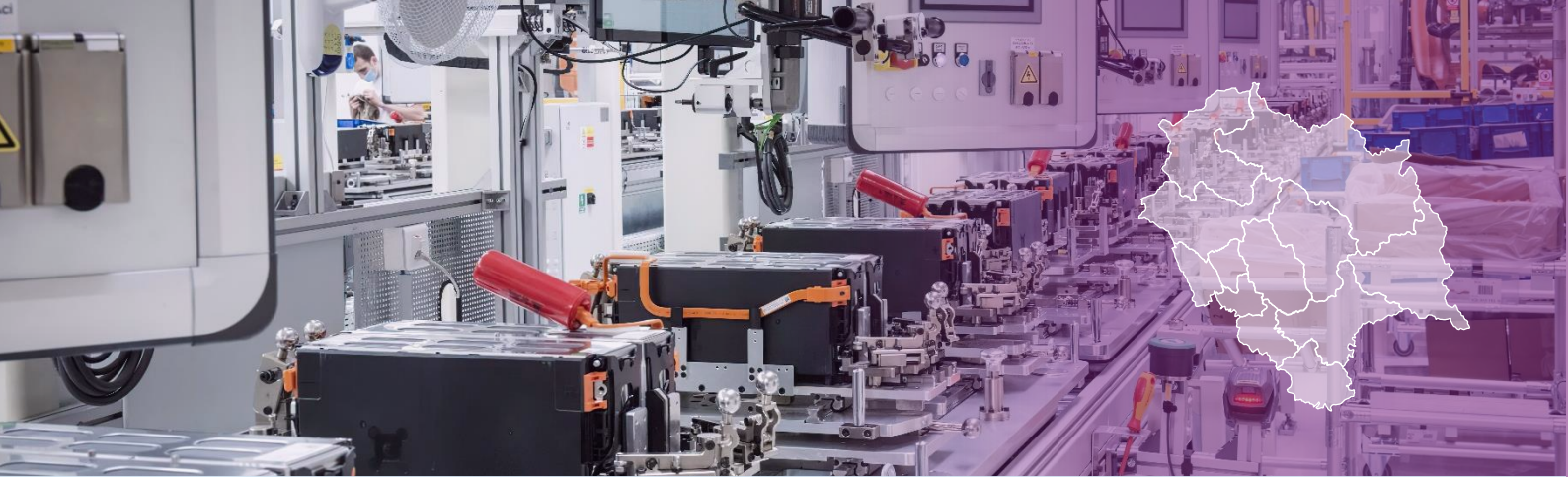
States in the peer group based on similar GSDP per capita
Kerala, Madhya Pradesh, New Delhi, Telangana, Andhra Pradesh, Rajasthan
Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation



Himachal Pradesh

IMI
Overall Rank

8

IMI
Score

31.20

Category

Hill States

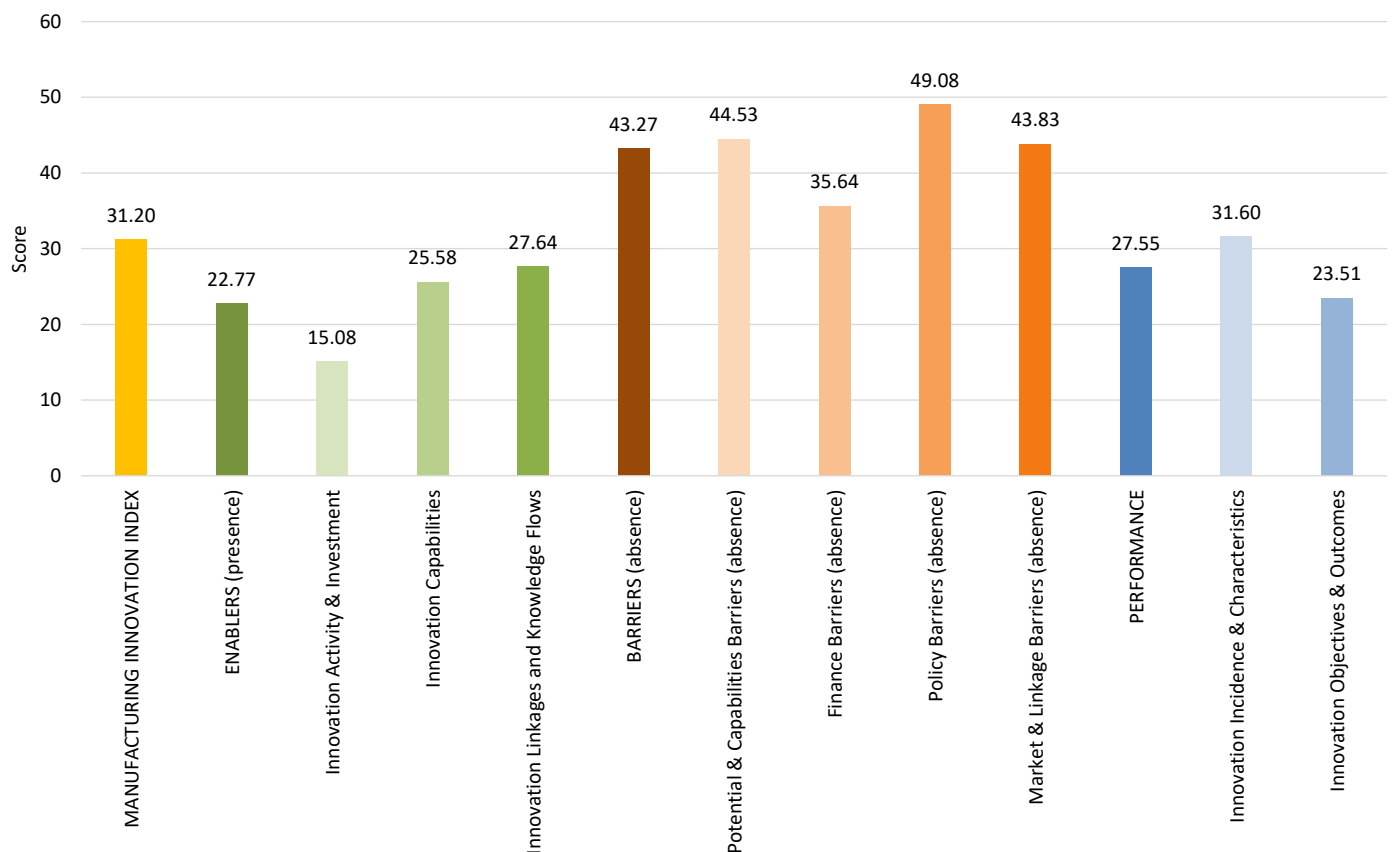
IMI Category Rank

2

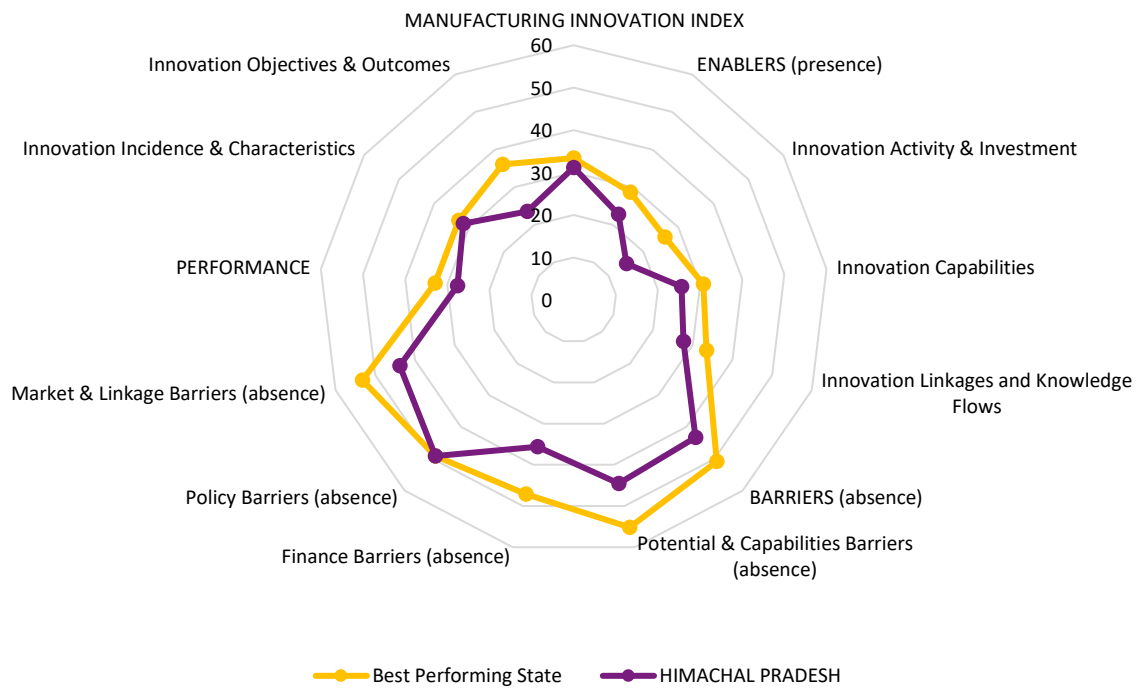
GSDP per capita (INR lakhs)

1.40

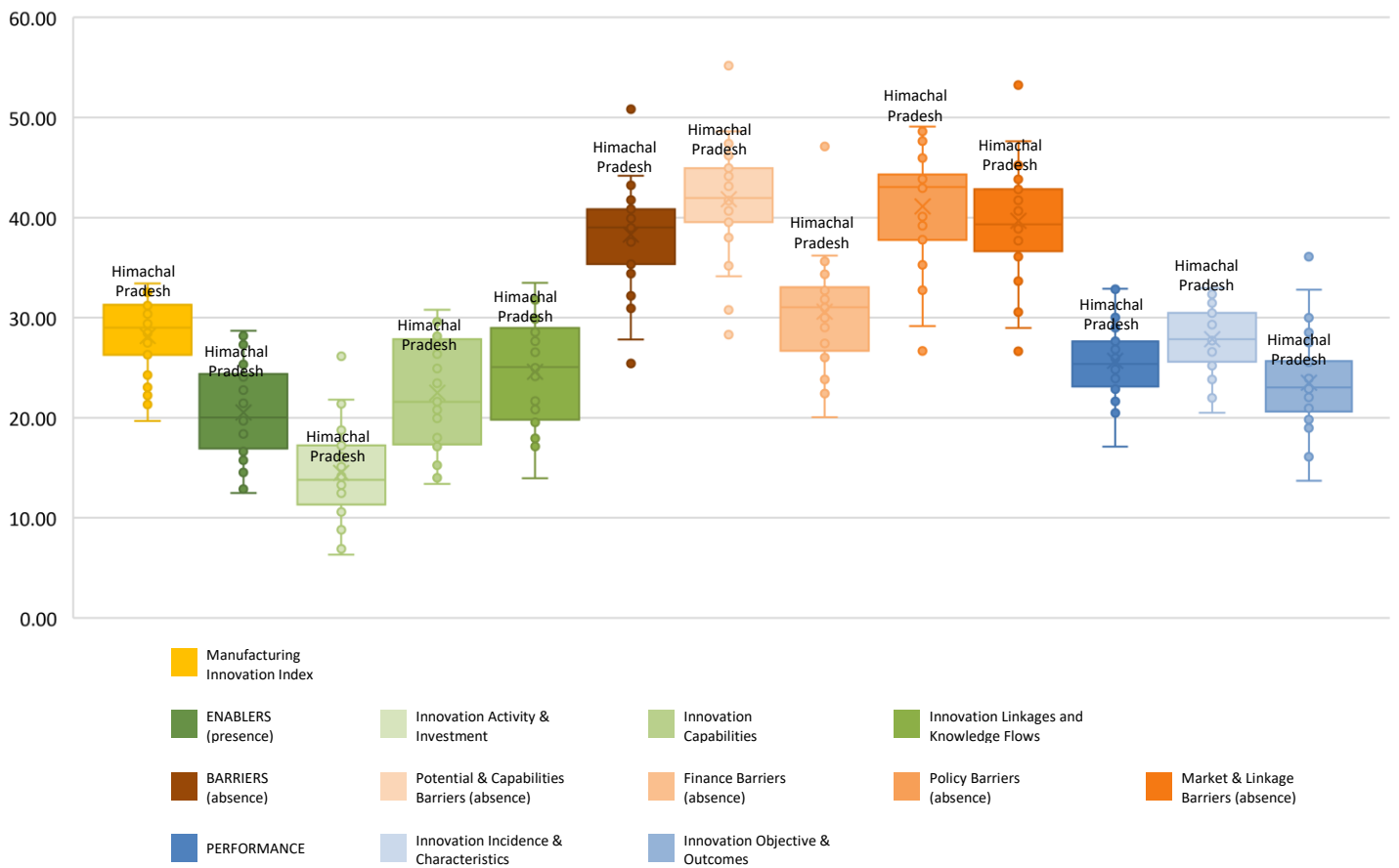
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

31.20

Peer Group Performance

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Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	22.77	•	11	2	Barriers (absence)	43.27	•	4	1	Performance	27.55	•	8	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	15.08	•	10	2
1.1	Firms engaging in tangible innovation input activities	6.19	•	20	3
1.2	Firms engaging in knowledge-based capital (intangible) activities	13.27	•	12	2
1.3	Firms investing in tangible activities	15.93	•	9	2
1.4	Firms investing in knowledge-based capital (intangible) activities	24.34	•	10	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	25.58	•	10	1
2.1	Firms with internal sources of financing	21.24	•	15	2
2.2	Firms with internal funding available for training	29.65	•	11	2
2.3	Firms with R&D Staff	18.14	•	8	1
2.4	Firms using innovative tools and practices among staff that are successful	15.04	•	14	2
2.5	Firms employing/ engaging experts in advanced digital tools in house	26.55	•	14	1
2.6	Firms employing highly qualified personnel, by level of educational attainment	35.84	•	5	1
2.7	Firms highly satisfied with innovation capabilities of employees	56.19	•	5	1
2.8	Firms using advanced, enabling or emerging technologies	6.64	•	10	1
2.9	Firms making use of internal information sources for innovation	35.84	•	11	1
2.10	Firms with an R&D strategy	20.80	•	6	2
2.11	Firms with an I4.0 strategy	4.42	•	4	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	27.64	•	10	1
3.1	Firms highly satisfied with investment climate in the state	57.52	•	9	1
3.2	Firms highly satisfied with ease of doing business in the state	59.73	•	10	1
3.3	Firms highly satisfied with govt. support for enabling innovation	48.67	•	6	1
3.4	Firms highly satisfied with innovation infrastructure in the state	54.87	•	5	1
3.5	Firms highly satisfied with innovation capabilities of external talent pool	38.50	•	7	1
3.6	Firms with formal cooperation agreements	4.42	•	9	2
3.7	Firms with informal cooperation agreements	4.87	•	17	2
3.8	Firms engaging experts in advanced digital tools from external sources	6.19	•	15	2
3.9	Firms selling products in international markets	25.66	•	10	1
3.10	Firms importing from international markets	10.62	•	11	2
3.11	Firms that collaborated with other parties on innovation activities within India	15.49	•	11	1
3.12	Firms that collaborated with other parties on innovation activities from abroad	6.19	•	3	1
3.13	Firms making use of external information sources for innovation	28.32	•	20	2
3.14	Firms with external sources of financing	4.42	•	21	3
3.15	Firms with external funding available for training	1.77	•	17	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	44.53	•	8	2
4.1	Innovation capabilities (R&D, design, etc.) insufficient	38.94	•	9	2
4.2	Organizational rigidities within the firm	46.02	•	10	3
4.3	No need due to prior innovations by this firm	46.02	•	13	2
4.4	Lack of qualified personnel	41.59	•	7	2
4.5	Lack of good ideas for innovations	48.23	•	7	2
4.6	Lack of firm-level infrastructure	46.90	•	4	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	35.64	•	4	1
5.1	Lack of funds within the firm or group	32.30	•	3	1
5.2	Lack of finance from sources outside the firm (credit)	36.73	•	3	1
5.3	Excessive perceived risks	39.38	•	4	1
5.4	Innovation costs too high	34.07	•	5	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	49.08	•	1	1
6.1	Regulations, standards, taxation	49.56	•	2	1

6.2	Weakness of intellectual property rights	51.33	•	7	2
6.3	Legislative barriers	46.46	•	2	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	43.83	•	5	2
7.1	Lack of information on markets	43.36	•	9	3
7.2	Deficiencies in the availability of external services	41.59	•	8	2
7.3	Difficulty in finding cooperation partners	45.13	•	7	2
7.4	Lack of information on technology	46.02	•	2	1
7.5	Market dominated by established firms	41.59	•	11	3
7.6	No need due to very little competition in firm's market	51.77	•	6	2
7.7	Uncertain demand for innovative goods or services	40.27	•	6	2
7.8	Low demand for innovations in your market	41.59	•	3	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	31.60	•	3	1
8.1	Firms with new or significantly improved goods	14.16	•	13	2
8.2	Firms with new or significantly improved services	2.21	•	19	2
8.3	Share of new-to-market (NTM) product innovators	65.63	•	1	1
8.4	Firms with at least one type of product innovation developed entirely in-house	100.00	•	7	1
8.5	Firms into innovations in operations and product/process development	12.39	•	11	2
8.6	Firms into innovations in marketing and Sales	3.98	•	25	4
8.7	Firms into innovations in procurement, logistics, and distribution	4.87	•	13	1
8.8	Firms into innovations in administration and management	2.65	•	24	4
8.9	Share of new-to-market (NTM) business process innovators	35.71	•	2	1
8.10	Firms with at least one type of business process innovation developed entirely in-house	76.67	•	23	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	23.51	•	12	2
Objectives					
9.1	Increase the firm's turnover	23.01	•	22	2
9.2	Increase market presence	23.89	•	22	2
9.3	Reduce costs	19.91	•	18	3
9.4	Product/process enhancement in terms of quality and quantity	19.91	•	21	2
9.5	Reduce environmental impacts	16.37	•	22	3
9.6	Improve health and safety of the firm's employees	17.26	•	13	2
9.7	Meet regulatory requirements (e.g., standards, etc.)	16.37	•	20	2
9.8	Catering to Corporate Social Responsibility	15.93	•	16	2
Outcomes					
9.9	Opened up new market opportunities	19.03	•	14	2
9.10	Responded to existing or forthcoming regulatory provisions	13.27	•	12	2
9.11	Responded to market pressures	19.91	•	10	2
9.12	Responded to cost pressures	17.26	•	16	2
9.13	Improved firm's turnover	19.47	•	16	2
9.14	Firms reporting turnover from new-to-market product innovations	56.25	•	3	1
9.15	Firms reporting turnover from NTM business process innovations	28.57	•	7	3
9.16	Turnover of an innovative firm (% of GSDP per capita)	56.53	•	8	2
9.17	Employment in innovative firms (as a percentage of total employment)	43.85	•	12	3
9.18	Firms that were granted IP rights	26.99	•	1	1
9.19	Firms that attained innovation outcomes through I4.0 technologies	4.87	•	12	1

States in the peer group based on similar GSDP per capita

Jammu & Kashmir, Dadra & Nagar Haveli & Daman & Diu, Goa, Uttarakhand, Chandigarh, Puducherry

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation



Jammu & Kashmir

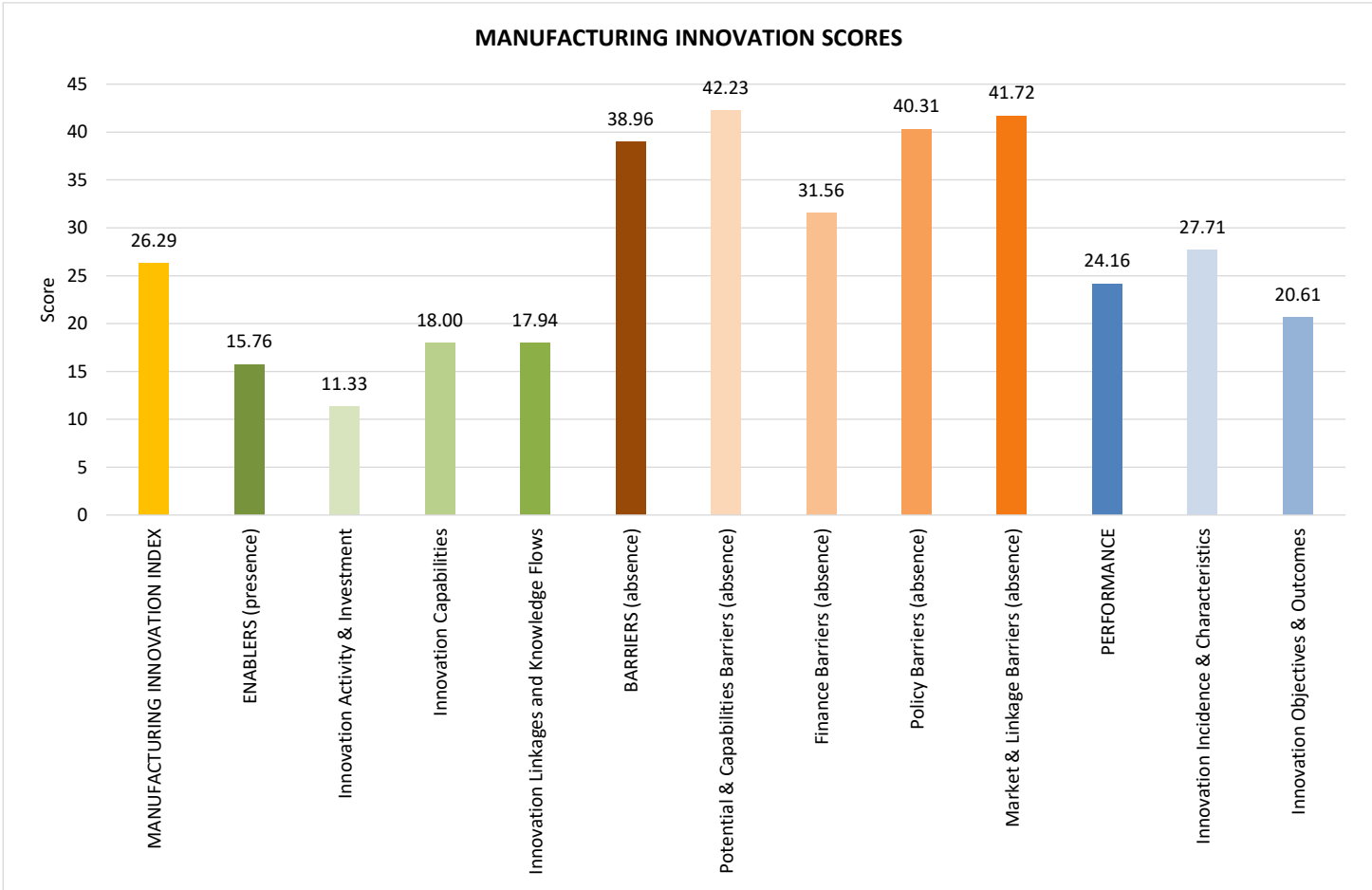
IMII
Overall
Rank

21

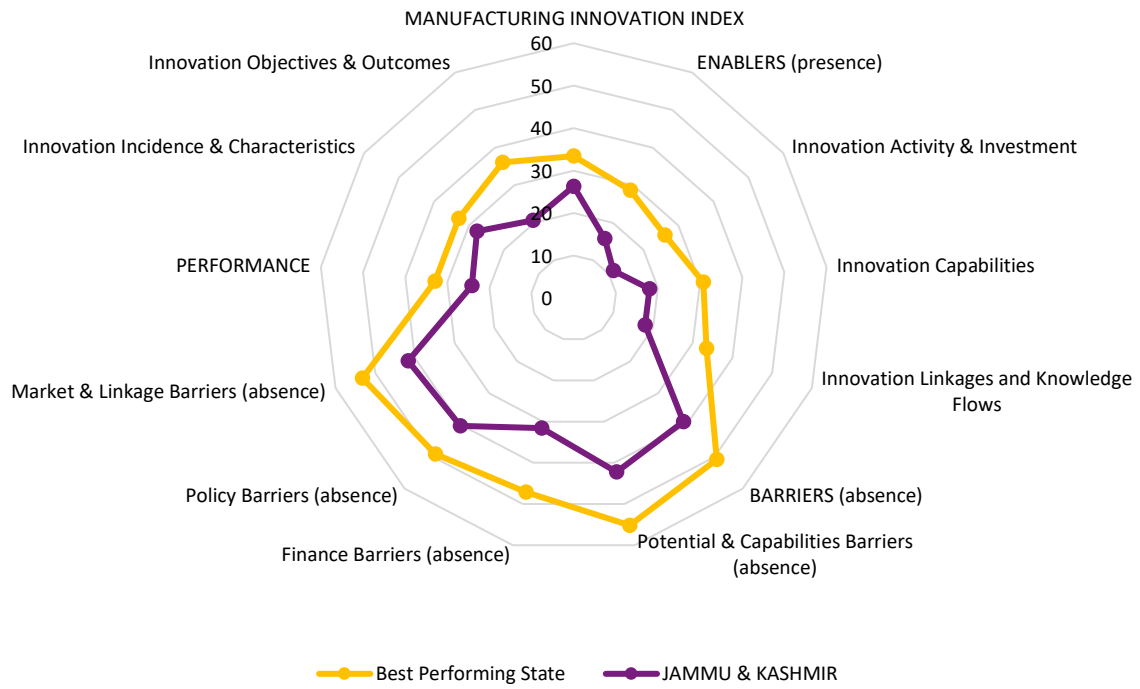
IMII
Score

26.29

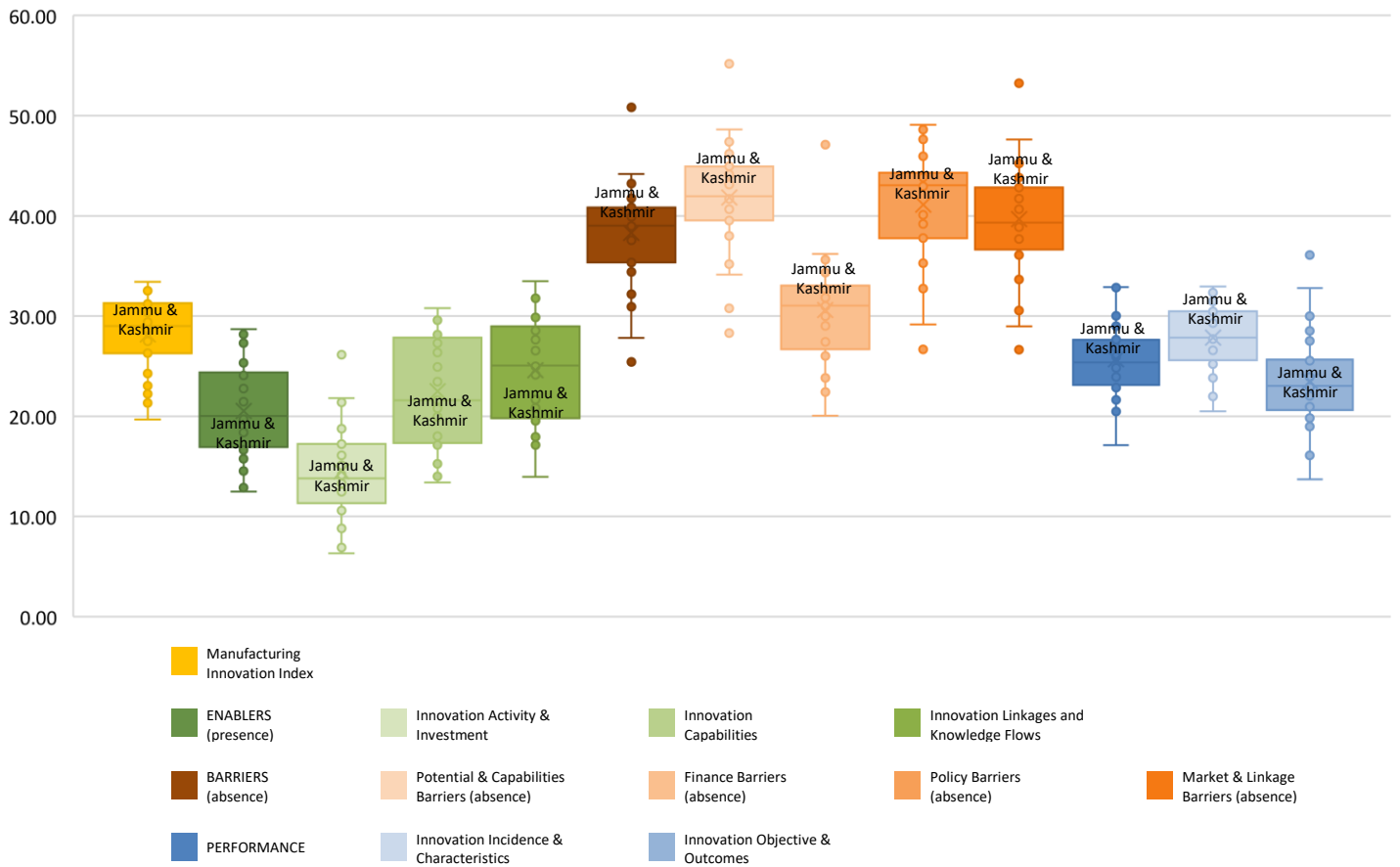
Category	IMII Category Rank	GSDP per capita (INR lakhs)
Hill States	3	0.68



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

26.29

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	15.76	•	23	3

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Barriers (absence)	38.96	•	15	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1 Innovation Activity & Investment		11.33	•	21	3
1.1	Firms engaging in tangible innovation input activities	5.43	•	25	4
1.2	Firms engaging in knowledge-based capital (intangible) activities	9.78	•	20	3
1.3	Firms investing in tangible activities	10.87	•	22	4
1.4	Firms investing in knowledge-based capital (intangible) activities	18.48	•	18	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2 Innovation Capabilities		18.00	•	20	3
2.1	Firms with internal sources of financing	13.59	•	25	4
2.2	Firms with internal funding available for training	17.39	•	20	3
2.3	Firms with R&D Staff	12.50	•	15	3
2.4	Firms using innovative tools and practices among staff that are successful	9.24	•	21	4
2.5	Firms employing/ engaging experts in advanced digital tools in house	18.48	•	21	3
2.6	Firms employing highly qualified personnel, by level of educational attainment	22.28	•	23	4
2.7	Firms highly satisfied with innovation capabilities of employees	38.04	•	25	3
2.8	Firms using advanced, enabling or emerging technologies	3.80	•	21	3
2.9	Firms making use of internal information sources for innovation	38.04	•	11	1
2.10	Firms with an R&D strategy	14.13	•	13	3
2.11	Firms with an I4.0 strategy	3.26	•	17	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3 Innovation Linkages and Knowledge Flows		17.94	•	25	3
3.1	Firms highly satisfied with investment climate in the state	41.30	•	23	3
3.2	Firms highly satisfied with ease of doing business in the state	45.65	•	22	3
3.3	Firms highly satisfied with govt. support for enabling innovation	27.72	•	24	3
3.4	Firms highly satisfied with innovation infrastructure in the state	29.35	•	26	3
3.5	Firms highly satisfied with innovation capabilities of external talent pool	22.28	•	25	3
3.6	Firms with formal cooperation agreements	1.63	•	23	3
3.7	Firms with informal cooperation agreements	3.80	•	21	4
3.8	Firms engaging experts in advanced digital tools from external sources	3.80	•	23	4
3.9	Firms selling products in international markets	14.67	•	22	3
3.10	Firms importing from international markets	8.15	•	15	3
3.11	Firms that collaborated with other parties on innovation activities within India	9.24	•	24	4
3.12	Firms that collaborated with other parties on innovation activities from abroad	2.17	•	21	3
3.13	Firms making use of external information sources for innovation	27.17	•	21	3
3.14	Firms with external sources of financing	2.17	•	27	4
3.15	Firms with external funding available for training	1.63	•	19	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4 Potential & Capabilities Barriers Pillar Score		42.23	•	13	3
4.1	Innovation capabilities (R&D, design, etc.) insufficient	38.04	•	13	3
4.2	Organizational rigidities within the firm	46.20	•	9	2
4.3	No need due to prior innovations by this firm	44.02	•	19	3
4.4	Lack of qualified personnel	37.50	•	14	3
4.5	Lack of good ideas for innovations	45.65	•	13	3
4.6	Lack of firm-level infrastructure	42.39	•	16	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5 Finance Barriers Pillar Score		31.56	•	12	3
5.1	Lack of funds within the firm or group	27.72	•	12	2
5.2	Lack of finance from sources outside the firm (credit)	30.98	•	14	3
5.3	Excessive perceived risks	35.87	•	13	3
5.4	Innovation costs too high	31.52	•	14	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6 Policy Barriers Pillar Score		40.31	•	17	3
6.1	Regulations, standards, taxation	40.22	•	17	3

Peer Group Performance

•

6.2	Weakness of intellectual property rights	48.37	•	15	3
6.3	Legislative barriers	32.61	•	16	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7 Market & Linkage Barriers Pillar Score		41.72	•	11	3
7.1	Lack of information on markets	44.02	•	6	2
7.2	Deficiencies in the availability of external services	41.30	•	9	3
7.3	Difficulty in finding cooperation partners	44.02	•	8	3
7.4	Lack of information on technology	43.48	•	7	3
7.5	Market dominated by established firms	42.93	•	6	2
7.6	No need due to very little competition in firm's market	48.37	•	15	3
7.7	Uncertain demand for innovative goods or services	36.41	•	13	3
7.8	Low demand for innovations in your market	33.70	•	17	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8 Innovation Incidence & Characteristics		27.71	•	15	3
8.1	Firms with new or significantly improved goods	7.61	•	23	4
8.2	Firms with new or significantly improved services	1.63	•	23	3
8.3	Share of new-to-market (NTM) product innovators	57.14	•	3	2
8.4	Firms with at least one type of product innovation developed entirely in-house	100.00	•	2	2
8.5	Firms into innovations in operations and product/process development	3.26	•	27	4
8.6	Firms into innovations in marketing and Sales	6.52	•	13	2
8.7	Firms into innovations in procurement, logistics, and distribution	2.17	•	25	4
8.8	Firms into innovations in administration and management	5.98	•	5	1
8.9	Share of new-to-market (NTM) business process innovators	16.67	•	18	3
8.10	Firms with at least one type of business process innovation developed entirely in-house	82.35	•	10	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9 Innovation Objectives & Outcomes		20.61	•	21	3
Objectives					
9.1	Increase the firm's turnover	22.83	•	23	3
9.2	Increase market presence	23.37	•	24	4
9.3	Reduce costs	20.11	•	17	2
9.4	Product/process enhancement in terms of quality and quantity	17.93	•	24	3
9.5	Reduce environmental impacts	17.39	•	16	2
9.6	Improve health and safety of the firm's employees	16.30	•	21	3
9.7	Meet regulatory requirements (e.g., standards, etc.)	15.22	•	22	3
9.8	Catering to Corporate Social Responsibility	14.67	•	17	3
Outcomes					
9.9	Opened up new market opportunities	13.59	•	22	4
9.10	Responded to existing or forthcoming regulatory provisions	9.78	•	23	3
9.11	Responded to market pressures	13.04	•	23	4
9.12	Responded to cost pressures	10.33	•	25	4
9.13	Improved firm's turnover	13.04	•	24	4
9.14	Firms reporting turnover from new-to-market product innovations	42.86	•	13	2
9.15	Firms reporting turnover from NTM business process innovations	33.33	•	3	2
9.16	Turnover of an innovative firm (% of GSDP per capita)	69.72	•	6	1
9.17	Employment in innovative firms (as a percentage of total employment)	34.89	•	24	4
9.18	Firms that were granted IP rights	13.59	•	19	3
9.19	Firms that attained innovation outcomes through I4.0 technologies	4.35	•	13	2

States in the peer group based on similar GSDP per capita
Himachal Pradesh, Dadra & Nagar Haveli & Daman & Diu, Goa, Uttarakhand, Chandigarh, Puducherry

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation
² Between national average plus standard deviation and national average minus standard deviation
³ Less than national average minus standard deviation



Jharkhand

IMI
Overall
Rank

24

IMI
Score

22.78

Category

IMI Category Rank

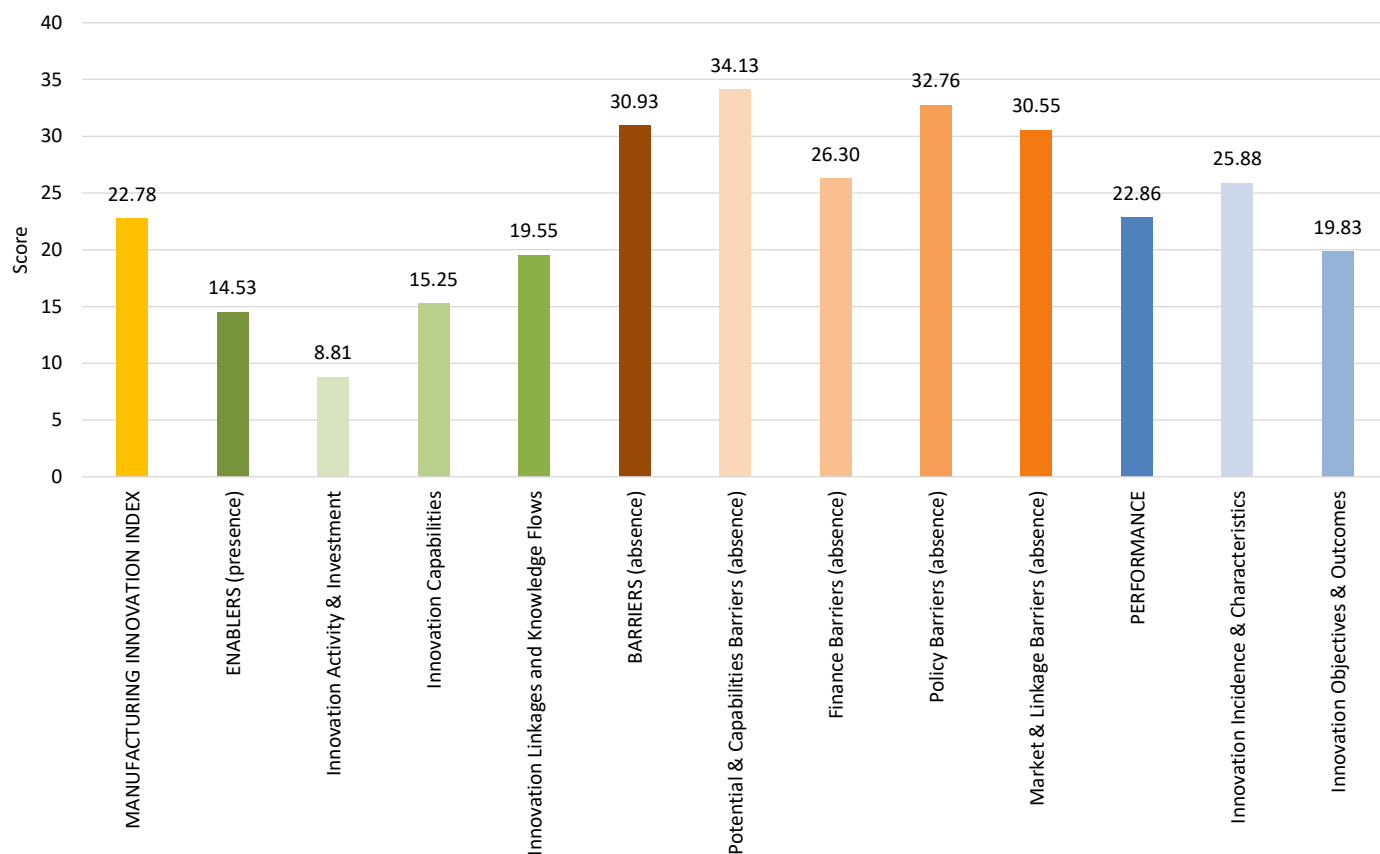
GSDP per capita (INR lakhs)

Major States

16

0.55

MANUFACTURING INNOVATION SCORES



IMII Score

22.78

Peer Group Performance

•

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	14.53	•	24	16	Barriers (absence)	30.93	•	25	17	Performance	22.86	•	22	14

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	8.81	•	25	16
1.1	Firms engaging in tangible innovation input activities	5.61	•	23	15
1.2	Firms engaging in knowledge-based capital (intangible) activities	7.17	•	25	16
1.3	Firms investing in tangible activities	9.35	•	25	17
1.4	Firms investing in knowledge-based capital (intangible) activities	12.77	•	24	16

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	15.25	•	24	16
2.1	Firms with internal sources of financing	14.95	•	23	16
2.2	Firms with internal funding available for training	12.46	•	25	17
2.3	Firms with R&D Staff	2.18	•	27	18
2.4	Firms using innovative tools and practices among staff that are successful	8.10	•	23	14
2.5	Firms employing/ engaging experts in advanced digital tools in house	13.71	•	23	15
2.6	Firms employing highly qualified personnel, by level of educational attainment	20.25	•	25	16
2.7	Firms highly satisfied with innovation capabilities of employees	41.74	•	21	14
2.8	Firms using advanced, enabling or emerging technologies	3.12	•	23	15
2.9	Firms making use of internal information sources for innovation	32.71	•	20	12
2.10	Firms with an R&D strategy	5.92	•	24	16
2.11	Firms with an I4.0 strategy	1.56	•	23	15

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	19.55	•	22	15
3.1	Firms highly satisfied with investment climate in the state	44.86	•	20	13
3.2	Firms highly satisfied with ease of doing business in the state	46.42	•	21	14
3.3	Firms highly satisfied with govt. support for enabling innovation	35.20	•	20	13
3.4	Firms highly satisfied with innovation infrastructure in the state	37.07	•	21	14
3.5	Firms highly satisfied with innovation capabilities of external talent pool	28.04	•	20	14
3.6	Firms with formal cooperation agreements	2.49	•	17	10
3.7	Firms with informal cooperation agreements	3.74	•	22	14
3.8	Firms engaging experts in advanced digital tools from external sources	4.36	•	21	14
3.9	Firms selling products in international markets	6.85	•	26	17
3.10	Firms importing from international markets	1.25	•	27	18
3.11	Firms that collaborated with other parties on innovation activities within India	9.35	•	22	15
3.12	Firms that collaborated with other parties on innovation activities from abroad	1.25	•	25	16
3.13	Firms making use of external information sources for innovation	31.46	•	13	9
3.14	Firms with external sources of financing	2.80	•	25	17
3.15	Firms with external funding available for training	1.25	•	22	15

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	34.13	•	25	17
4.1	Innovation capabilities (R&D, design, etc.) insufficient	30.84	•	24	17
4.2	Organizational rigidities within the firm	33.96	•	25	17
4.3	No need due to prior innovations by this firm	38.01	•	24	17
4.4	Lack of qualified personnel	28.66	•	26	18
4.5	Lack of good ideas for innovations	36.14	•	24	17
4.6	Lack of firm-level infrastructure	37.07	•	23	16

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	26.30	•	23	16
5.1	Lack of funds within the firm or group	22.12	•	22	15
5.2	Lack of finance from sources outside the firm (credit)	25.55	•	24	17
5.3	Excessive perceived risks	29.91	•	22	15
5.4	Innovation costs too high	27.73	•	20	13

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	32.76	•	25	17
6.1	Regulations, standards, taxation	32.40	•	25	17

6.2	Weakness of intellectual property rights	38.32	•	25	17
6.3	Legislative barriers	27.73	•	23	15

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	30.55	•	25	17
7.1	Lack of information on markets	31.46	•	25	17
7.2	Deficiencies in the availability of external services	29.91	•	26	18
7.3	Difficulty in finding cooperation partners	31.15	•	26	18
7.4	Lack of information on technology	31.15	•	25	17
7.5	Market dominated by established firms	30.84	•	25	17
7.6	No need due to very little competition in firm's market	38.94	•	24	17
7.7	Uncertain demand for innovative goods or services	27.73	•	25	17
7.8	Low demand for innovations in your market	24.92	•	27	18

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	25.88	•	19	12
8.1	Firms with new or significantly improved goods	5.30	•	26	17
8.2	Firms with new or significantly improved services	1.56	•	24	16
8.3	Share of new-to-market (NTM) product innovators	50.00	•	9	5
8.4	Firms with at least one type of product innovation developed entirely in-house	88.89	•	27	18
8.5	Firms into innovations in operations and product/process development	7.48	•	23	15
8.6	Firms into innovations in marketing and Sales	2.80	•	26	17
8.7	Firms into innovations in procurement, logistics, and distribution	3.12	•	23	15
8.8	Firms into innovations in administration and management	2.49	•	25	16
8.9	Share of new-to-market (NTM) business process innovators	25.00	•	9	4
8.10	Firms with at least one type of business process innovation developed entirely in-house	79.31	•	16	8

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	19.83	•	22	14
Objectives					
9.1	Increase the firm's turnover	23.36	•	21	15
9.2	Increase market presence	25.55	•	20	15
9.3	Reduce costs	18.38	•	22	14
9.4	Product/process enhancement in terms of quality and quantity	18.07	•	23	16
9.5	Reduce environmental impacts	14.95	•	24	16
9.6	Improve health and safety of the firm's employees	11.84	•	24	16
9.7	Meet regulatory requirements (e.g., standards, etc.)	13.40	•	24	16
9.8	Catering to Corporate Social Responsibility	10.90	•	24	16
Outcomes					
9.9	Opened up new market opportunities	11.21	•	25	16
9.10	Responded to existing or forthcoming regulatory provisions	7.79	•	25	17
9.11	Responded to market pressures	9.97	•	26	17
9.12	Responded to cost pressures	9.97	•	26	17
9.13	Improved firm's turnover	11.53	•	25	16
9.14	Firms reporting turnover from new-to-market product innovations	50.00	•	7	5
9.15	Firms reporting turnover from NTM business process innovations	29.17	•	5	2
9.16	Turnover of an innovative firm (% of GSDP per capita)	84.55	•	3	3
9.17	Employment in innovative firms (as a percentage of total employment)	34.00	•	25	16
9.18	Firms that were granted IP rights	10.90	•	25	16
9.19	Firms that attained innovation outcomes through I4.0 technologies	2.18	•	22	14

States in the peer group based on similar GSDP per capita

Assam, Chhattisgarh, Uttarakhand, Dadra & Nagar Haveli & Daman & Diu, Himachal Pradesh, Jammu & Kashmir

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation



Karnataka

IMI
Overall
Rank

1

IMI
Score

33.41

Category

IMI Category Rank

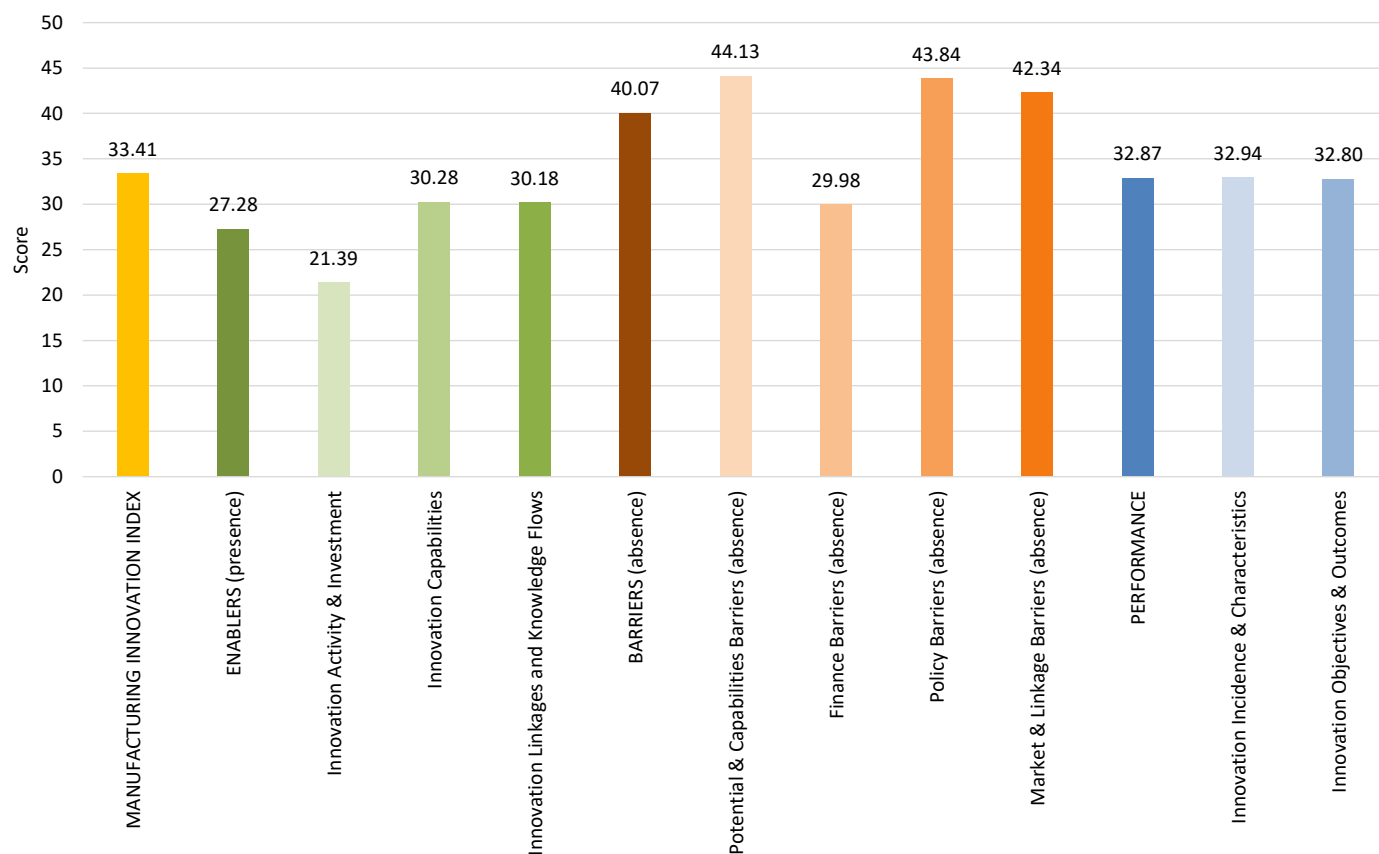
GSDP per capita (INR lakhs)

Major States

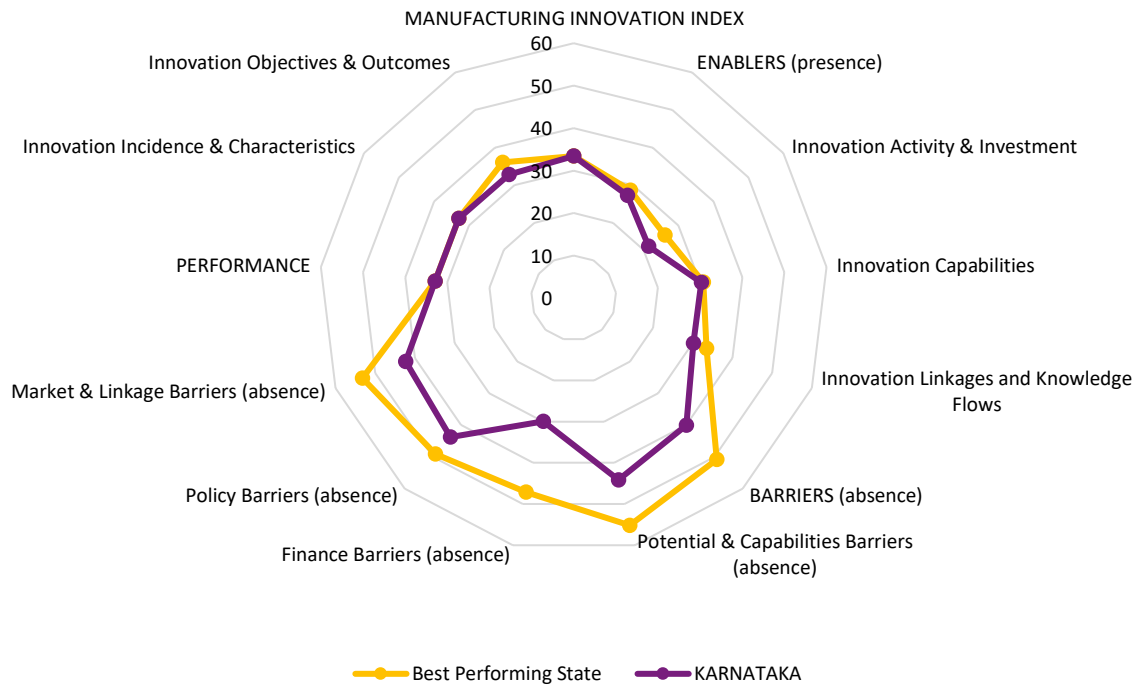
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1.55

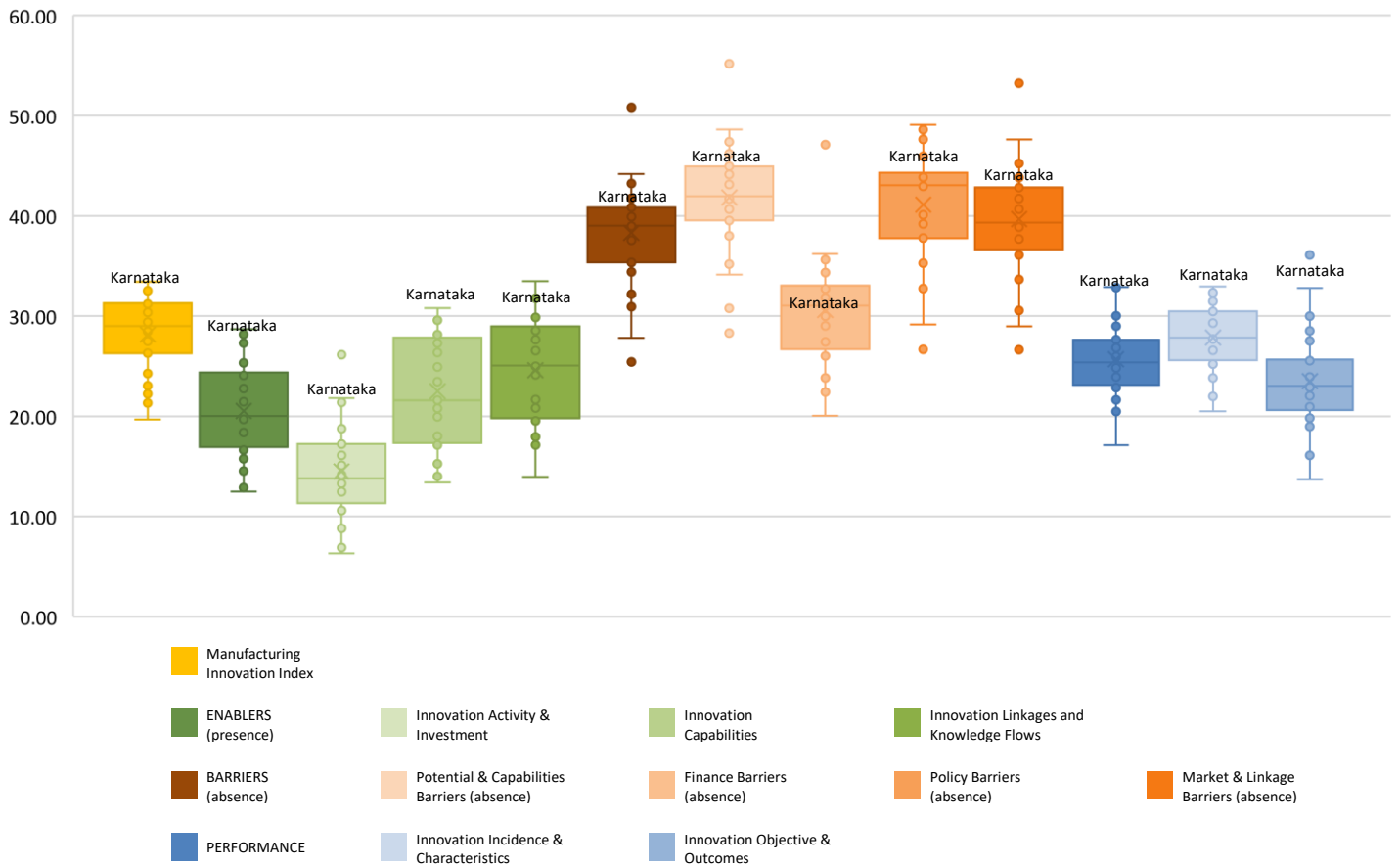
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

33.41

Peer Group Performance



Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	27.28	●	3	2	Barriers (absence)	40.07	●	11	7	Performance	32.87	●	1	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	21.39	●	3	2
1.1	Firms engaging in tangible innovation input activities	11.94	●	5	4
1.2	Firms engaging in knowledge-based capital (intangible) activities	23.58	●	1	1
1.3	Firms investing in tangible activities	15.82	●	10	5
1.4	Firms investing in knowledge-based capital (intangible) activities	32.54	●	1	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	30.28	●	2	1
2.1	Firms with internal sources of financing	30.75	●	3	2
2.2	Firms with internal funding available for training	28.96	●	8	3
2.3	Firms with R&D Staff	13.43	●	13	7
2.4	Firms using innovative tools and practices among staff that are successful	22.99	●	2	2
2.5	Firms employing/ engaging experts in advanced digital tools in house	36.42	●	1	1
2.6	Firms employing highly qualified personnel, by level of educational attainment	38.51	●	4	2
2.7	Firms highly satisfied with innovation capabilities of employees	60.00	●	4	3
2.8	Firms using advanced, enabling or emerging technologies	6.87	●	13	8
2.9	Firms making use of internal information sources for innovation	49.85	●	3	2
2.10	Firms with an R&D strategy	22.99	●	3	2
2.11	Firms with an I4.0 strategy	6.87	●	3	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	30.18	●	3	2
3.1	Firms highly satisfied with investment climate in the state	60.60	●	5	3
3.2	Firms highly satisfied with ease of doing business in the state	63.28	●	6	3
3.3	Firms highly satisfied with govt. support for enabling innovation	46.27	●	9	5
3.4	Firms highly satisfied with innovation infrastructure in the state	53.43	●	8	4
3.5	Firms highly satisfied with innovation capabilities of external talent pool	38.21	●	8	4
3.6	Firms with formal cooperation agreements	8.36	●	2	1
3.7	Firms with informal cooperation agreements	8.36	●	1	1
3.8	Firms engaging experts in advanced digital tools from external sources	10.75	●	7	4
3.9	Firms selling products in international markets	27.46	●	7	7
3.10	Firms importing from international markets	13.73	●	4	3
3.11	Firms that collaborated with other parties on innovation activities within India	20.90	●	1	1
3.12	Firms that collaborated with other parties on innovation activities from abroad	5.67	●	6	3
3.13	Firms making use of external information sources for innovation	44.48	●	3	2
3.14	Firms with external sources of financing	8.66	●	5	4
3.15	Firms with external funding available for training	3.28	●	8	8

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	44.13	●	9	6
4.1	Innovation capabilities (R&D, design, etc.) insufficient	39.10	●	8	6
4.2	Organizational rigidities within the firm	46.27	●	8	6
4.3	No need due to prior innovations by this firm	48.36	●	8	6
4.4	Lack of qualified personnel	40.00	●	9	6
4.5	Lack of good ideas for innovations	47.46	●	8	5
4.6	Lack of firm-level infrastructure	44.18	●	11	7

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	29.98	●	17	11
5.1	Lack of funds within the firm or group	23.28	●	20	13
5.2	Lack of finance from sources outside the firm (credit)	29.55	●	16	10
5.3	Excessive perceived risks	36.12	●	12	8
5.4	Innovation costs too high	31.04	●	17	11

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	43.84	●	9	5
6.1	Regulations, standards, taxation	42.69	●	12	8

6.2	Weakness of intellectual property rights	48.96	●	12	7
6.3	Legislative barriers	40.00	●	10	6

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	42.34	●	8	5
7.1	Lack of information on markets	42.09	●	10	6
7.2	Deficiencies in the availability of external services	40.60	●	10	5
7.3	Difficulty in finding cooperation partners	43.88	●	10	6
7.4	Lack of information on technology	42.69	●	10	6
7.5	Market dominated by established firms	42.69	●	9	6
7.6	No need due to very little competition in firm's market	51.04	●	9	6
7.7	Uncertain demand for innovative goods or services	38.51	●	10	6
7.8	Low demand for innovations in your market	38.51	●	7	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	32.94	●	1	1
8.1	Firms with new or significantly improved goods	23.58	●	2	1
8.2	Firms with new or significantly improved services	8.36	●	2	2
8.3	Share of new-to-market (NTM) product innovators	48.81	●	10	6
8.4	Firms with at least one type of product innovation developed entirely in-house	96.43	●	13	9
8.5	Firms into innovations in operations and product/process development	18.51	●	2	2
8.6	Firms into innovations in marketing and Sales	11.34	●	3	2
8.7	Firms into innovations in procurement, logistics, and distribution	9.85	●	1	1
8.8	Firms into innovations in administration and management	8.36	●	2	2
8.9	Share of new-to-market (NTM) business process innovators	29.03	●	4	3
8.10	Firms with at least one type of business process innovation developed entirely in-house	81.71	●	12	6

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	32.80	●	2	2
Objectives					
9.1	Increase the firm's turnover	38.81	●	3	2
9.2	Increase market presence	42.99	●	3	2
9.3	Reduce costs	34.93	●	3	2
9.4	Product/process enhancement in terms of quality and quantity	33.73	●	3	2
9.5	Reduce environmental impacts	29.85	●	2	2
9.6	Improve health and safety of the firm's employees	28.96	●	2	2
9.7	Meet regulatory requirements (e.g., standards, etc.)	28.36	●	2	2
9.8	Catering to Corporate Social Responsibility	26.27	●	2	2
Outcomes					
9.9	Opened up new market opportunities	34.33	●	2	2
9.10	Responded to existing or forthcoming regulatory provisions	25.37	●	1	1
9.11	Responded to market pressures	32.84	●	2	2
9.12	Responded to cost pressures	29.55	●	2	2
9.13	Improved firm's turnover	34.33	●	2	2
9.14	Firms reporting turnover from new-to-market product innovations	47.62	●	9	7
9.15	Firms reporting turnover from NTM business process innovations	29.03	●	6	3
9.16	Turnover of an innovative firm (% of GSDP per capita)	36.28	●	16	11
9.17	Employment in innovative firms (as a percentage of total employment)	55.25	●	3	2
9.18	Firms that were granted IP rights	20.00	●	10	6
9.19	Firms that attained innovation outcomes through I4.0 technologies	6.57	●	5	3

States in the peer group based on similar GSDP per capita Uttar Pradesh, Gujarat, Tamil Nadu, West Bengal, Rajasthan, Andhra Pradesh Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation

Kerala

IMI
Overall
Rank

13

IMI
Score

29.39

Category

IMI Category Rank

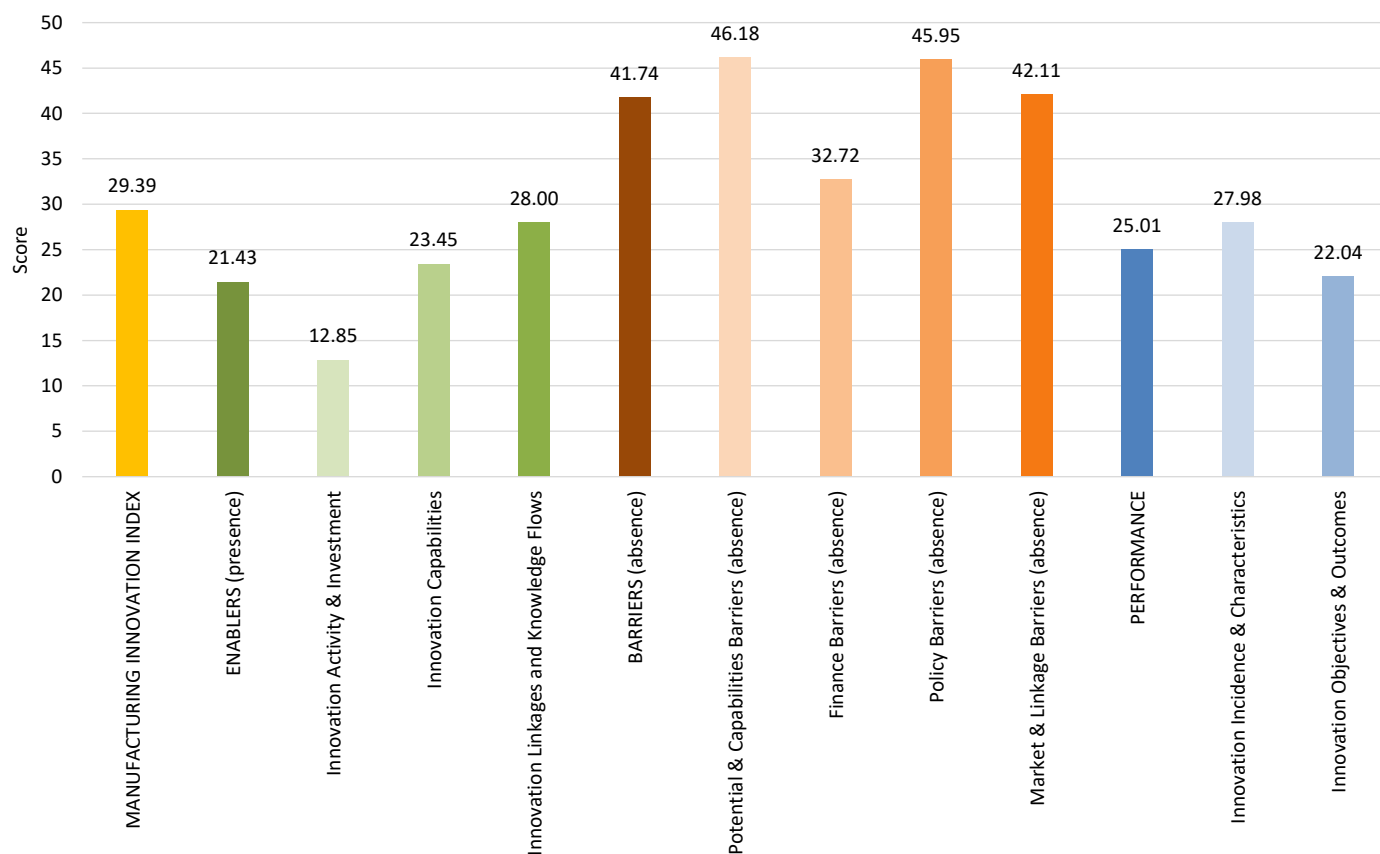
GSDP per capita (INR lakhs)

Major States

7

1.49

MANUFACTURING INNOVATION SCORES



IMII Score

29.39

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	21.43	•	13	7

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Barriers (absence)	41.74	•	6	3

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Performance	25.01	•	15	9

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	12.85	•	18	12
1.1	Firms engaging in tangible innovation input activities	6.64	•	17	11
1.2	Firms engaging in knowledge-based capital (intangible) activities	12.92	•	13	7
1.3	Firms investing in tangible activities	11.07	•	20	13
1.4	Firms investing in knowledge-based capital (intangible) activities	19.93	•	16	10

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	23.45	•	13	7
2.1	Firms with internal sources of financing	23.62	•	10	7
2.2	Firms with internal funding available for training	23.62	•	14	8
2.3	Firms with R&D Staff	14.02	•	11	5
2.4	Firms using innovative tools and practices among staff that are successful	11.44	•	17	10
2.5	Firms employing/ engaging experts in advanced digital tools in house	25.46	•	11	6
2.6	Firms employing highly qualified personnel, by level of educational attainment	28.78	•	14	8
2.7	Firms highly satisfied with innovation capabilities of employees	53.14	•	10	6
2.8	Firms using advanced, enabling or emerging technologies	8.12	•	7	4
2.9	Firms making use of internal information sources for innovation	42.80	•	8	5
2.10	Firms with an R&D strategy	11.07	•	20	12
2.11	Firms with an I4.0 strategy	2.58	•	21	13

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	28.00	•	9	6
3.1	Firms highly satisfied with investment climate in the state	62.73	•	4	2
3.2	Firms highly satisfied with ease of doing business in the state	63.84	•	4	2
3.3	Firms highly satisfied with govt. support for enabling innovation	47.23	•	8	4
3.4	Firms highly satisfied with innovation infrastructure in the state	54.61	•	6	3
3.5	Firms highly satisfied with innovation capabilities of external talent pool	34.69	•	13	7
3.6	Firms with formal cooperation agreements	2.95	•	15	8
3.7	Firms with informal cooperation agreements	5.90	•	8	6
3.8	Firms engaging experts in advanced digital tools from external sources	5.54	•	17	10
3.9	Firms selling products in international markets	25.46	•	11	8
3.10	Firms importing from international markets	7.01	•	18	10
3.11	Firms that collaborated with other parties on innovation activities within India	13.65	•	16	11
3.12	Firms that collaborated with other parties on innovation activities from abroad	2.95	•	15	10
3.13	Firms making use of external information sources for innovation	35.06	•	8	6
3.14	Firms with external sources of financing	5.54	•	17	10
3.15	Firms with external funding available for training	2.58	•	12	10

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	46.18	•	5	3
4.1	Innovation capabilities (R&D, design, etc.) insufficient	40.59	•	6	4
4.2	Organizational rigidities within the firm	44.65	•	15	10
4.3	No need due to prior innovations by this firm	49.82	•	5	3
4.4	Lack of qualified personnel	44.28	•	4	2
4.5	Lack of good ideas for innovations	49.82	•	5	3
4.6	Lack of firm-level infrastructure	48.71	•	3	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	32.72	•	9	5
5.1	Lack of funds within the firm or group	26.94	•	14	9
5.2	Lack of finance from sources outside the firm (credit)	34.32	•	6	4
5.3	Excessive perceived risks	36.90	•	9	6
5.4	Innovation costs too high	33.21	•	9	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	45.95	•	6	3
6.1	Regulations, standards, taxation	45.76	•	5	2

Peer Group Performance

•

6.2	Weakness of intellectual property rights	50.55	•	10	5
6.3	Legislative barriers	41.70	•	7	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	42.11	•	10	7
7.1	Lack of information on markets	43.54	•	8	5
7.2	Deficiencies in the availability of external services	39.48	•	15	9
7.3	Difficulty in finding cooperation partners	42.44	•	15	8
7.4	Lack of information on technology	42.80	•	9	5
7.5	Market dominated by established firms	42.44	•	10	7
7.6	No need due to very little competition in firm's market	52.03	•	5	3
7.7	Uncertain demand for innovative goods or services	38.75	•	8	4
7.8	Low demand for innovations in your market	37.27	•	12	8

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	27.98	•	13	8
8.1	Firms with new or significantly improved goods	15.87	•	10	7
8.2	Firms with new or significantly improved services	4.06	•	10	5
8.3	Share of new-to-market (NTM) product innovators	44.44	•	14	9
8.4	Firms with at least one type of product innovation developed entirely in-house	100.00	•	1	1
8.5	Firms into innovations in operations and product/process development	7.38	•	24	16
8.6	Firms into innovations in marketing and Sales	5.17	•	20	12
8.7	Firms into innovations in procurement, logistics, and distribution	5.17	•	10	7
8.8	Firms into innovations in administration and management	4.06	•	16	10
8.9	Share of new-to-market (NTM) business process innovators	15.00	•	19	12
8.10	Firms with at least one type of business process innovation developed entirely in-house	89.29	•	4	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	22.04	•	19	13
Objectives					
9.1	Increase the firm's turnover	26.20	•	14	10
9.2	Increase market presence	26.57	•	18	13
9.3	Reduce costs	22.51	•	15	10
9.4	Product/process enhancement in terms of quality and quantity	24.72	•	12	7
9.5	Reduce environmental impacts	18.08	•	14	9
9.6	Improve health and safety of the firm's employees	17.34	•	12	7
9.7	Meet regulatory requirements (e.g., standards, etc.)	16.61	•	18	13
9.8	Catering to Corporate Social Responsibility	16.24	•	14	9
Outcomes					
9.9	Opened up new market opportunities	22.14	•	9	6
9.10	Responded to existing or forthcoming regulatory provisions	15.87	•	6	4
9.11	Responded to market pressures	21.40	•	8	6
9.12	Responded to cost pressures	19.56	•	10	6
9.13	Improved firm's turnover	22.88	•	9	6
9.14	Firms reporting turnover from new-to-market product innovations	31.11	•	23	15
9.15	Firms reporting turnover from NTM business process innovations	25.00	•	11	6
9.16	Turnover of an innovative firm (% of GSDP per capita)	28.04	•	23	17
9.17	Employment in innovative firms (as a percentage of total employment)	36.45	•	20	13
9.18	Firms that were granted IP rights	19.19	•	11	7
9.19	Firms that attained innovation outcomes through I4.0 technologies	5.54	•	10	7

States in the peer group based on similar GSDP per capita

Haryana, Madhya Pradesh, New Delhi, Telangana, Andhra Pradesh, Rajasthan

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation



Madhya Pradesh

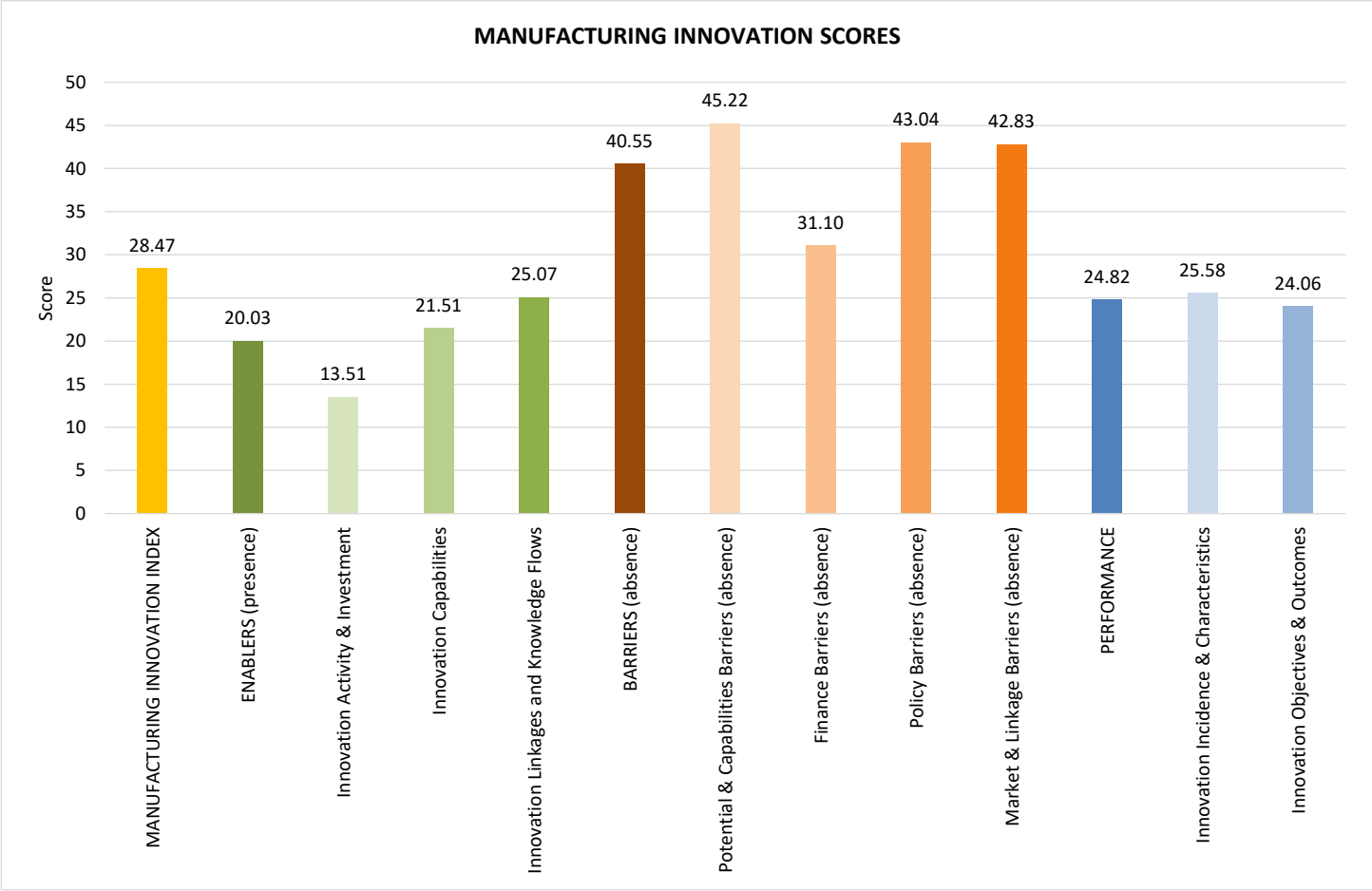
IMII
Overall
Rank

15

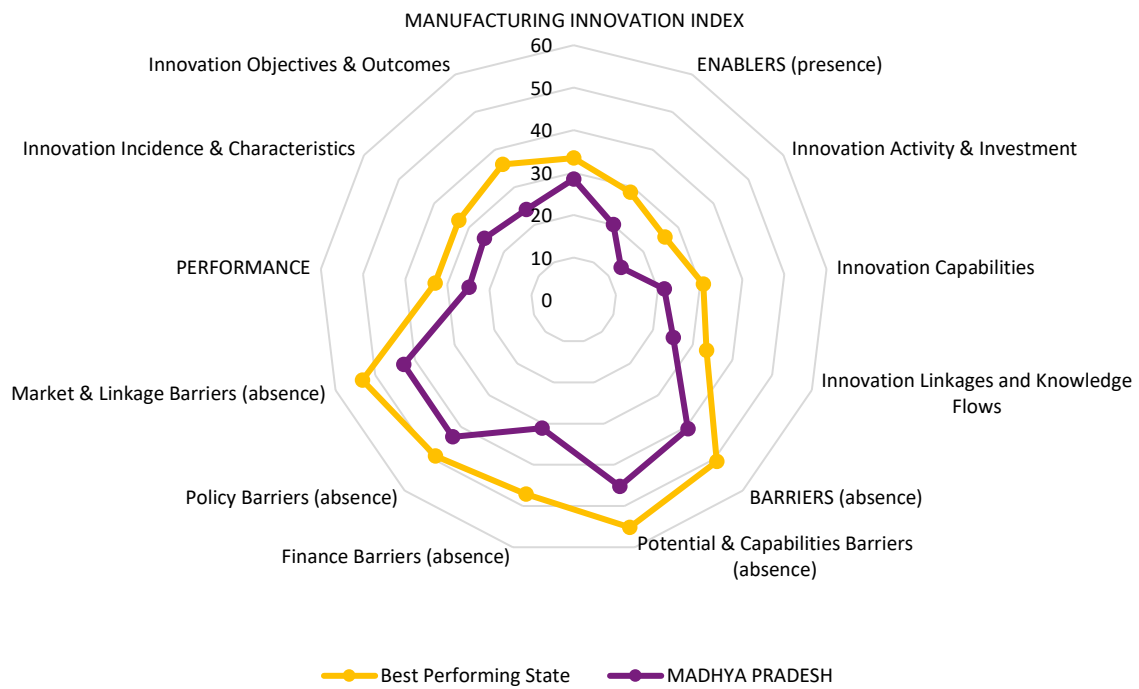
IMII
Score

28.47

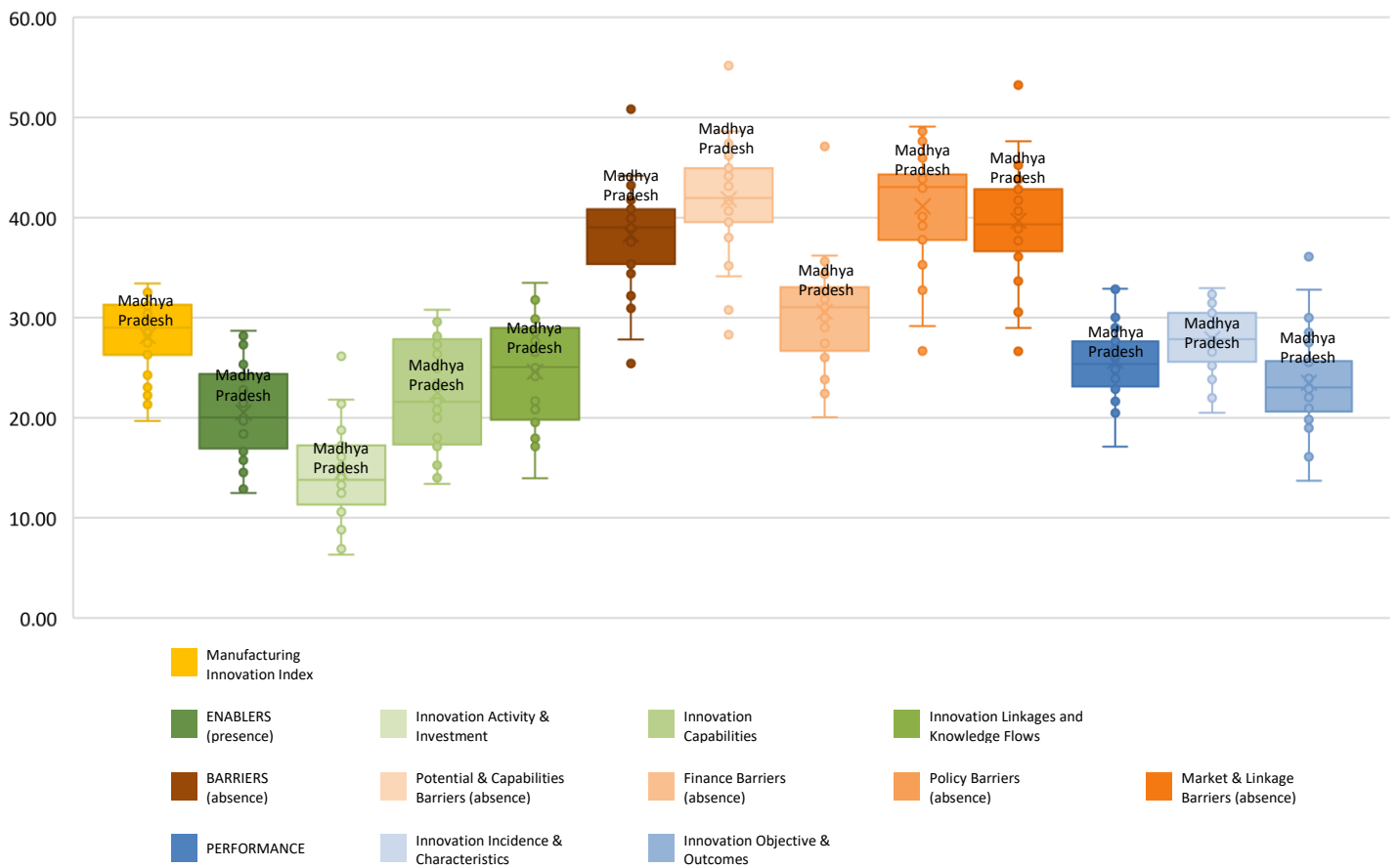
Category	IMII Category Rank	GSDP per capita (INR lakhs)
Major States	9	0.61



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

28.47

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	20.03	•	14	8

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Barriers (absence)	40.55	•	9	6

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	13.51	•	15	9
1.1	Firms engaging in tangible innovation input activities	6.53	•	18	12
1.2	Firms engaging in knowledge-based capital (intangible) activities	12.17	•	15	9
1.3	Firms investing in tangible activities	14.54	•	12	7
1.4	Firms investing in knowledge-based capital (intangible) activities	20.47	•	15	9

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	21.51	•	15	8
2.1	Firms with internal sources of financing	20.18	•	17	10
2.2	Firms with internal funding available for training	24.04	•	13	7
2.3	Firms with R&D Staff	10.09	•	18	11
2.4	Firms using innovative tools and practices among staff that are successful	10.68	•	19	11
2.5	Firms employing/ engaging experts in advanced digital tools in house	22.85	•	14	8
2.6	Firms employing highly qualified personnel, by level of educational attainment	29.08	•	13	7
2.7	Firms highly satisfied with innovation capabilities of employees	49.55	•	14	10
2.8	Firms using advanced, enabling or emerging technologies	4.75	•	18	11
2.9	Firms making use of internal information sources for innovation	38.28	•	10	7
2.10	Firms with an R&D strategy	12.46	•	16	8
2.11	Firms with an I4.0 strategy	3.26	•	16	9

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	25.07	•	14	9
3.1	Firms highly satisfied with investment climate in the state	53.71	•	14	8
3.2	Firms highly satisfied with ease of doing business in the state	56.97	•	13	7
3.3	Firms highly satisfied with govt. support for enabling innovation	40.36	•	15	9
3.4	Firms highly satisfied with innovation infrastructure in the state	48.96	•	12	8
3.5	Firms highly satisfied with innovation capabilities of external talent pool	30.86	•	16	10
3.6	Firms with formal cooperation agreements	3.26	•	14	7
3.7	Firms with informal cooperation agreements	5.64	•	11	9
3.8	Firms engaging experts in advanced digital tools from external sources	6.23	•	14	8
3.9	Firms selling products in international markets	18.40	•	19	12
3.10	Firms importing from international markets	6.23	•	21	13
3.11	Firms that collaborated with other parties on innovation activities within India	16.62	•	9	6
3.12	Firms that collaborated with other parties on innovation activities from abroad	5.34	•	9	6
3.13	Firms making use of external information sources for innovation	31.45	•	14	10
3.14	Firms with external sources of financing	4.75	•	19	12
3.15	Firms with external funding available for training	3.56	•	6	6

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	45.22	•	6	4
4.1	Innovation capabilities (R&D, design, etc.) insufficient	41.25	•	5	3
4.2	Organizational rigidities within the firm	47.18	•	7	5
4.3	No need due to prior innovations by this firm	45.99	•	14	10
4.4	Lack of qualified personnel	43.03	•	5	3
4.5	Lack of good ideas for innovations	47.18	•	9	6
4.6	Lack of firm-level infrastructure	46.88	•	5	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	31.10	•	13	8
5.1	Lack of funds within the firm or group	24.04	•	17	10
5.2	Lack of finance from sources outside the firm (credit)	29.08	•	17	11
5.3	Excessive perceived risks	37.98	•	7	4
5.4	Innovation costs too high	33.23	•	7	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	43.04	•	14	8
6.1	Regulations, standards, taxation	43.32	•	11	7

Peer Group Performance

•

6.2	Weakness of intellectual property rights	50.74	•	8	4
6.3	Legislative barriers	35.31	•	13	9

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	42.83	•	7	4
7.1	Lack of information on markets	46.29	•	4	2
7.2	Deficiencies in the availability of external services	42.73	•	5	3
7.3	Difficulty in finding cooperation partners	45.40	•	6	4
7.4	Lack of information on technology	44.51	•	6	3
7.5	Market dominated by established firms	42.73	•	8	5
7.6	No need due to very little competition in firm's market	49.26	•	14	9
7.7	Uncertain demand for innovative goods or services	41.25	•	5	3
7.8	Low demand for innovations in your market	32.34	•	19	13

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	25.58	•	21	13
8.1	Firms with new or significantly improved goods	13.95	•	14	8
8.2	Firms with new or significantly improved services	4.45	•	9	4
8.3	Share of new-to-market (NTM) product innovators	32.65	•	22	14
8.4	Firms with at least one type of product innovation developed entirely in-house	100.00	•	8	4
8.5	Firms into innovations in operations and product/process development	10.09	•	18	11
8.6	Firms into innovations in marketing and Sales	4.45	•	24	16
8.7	Firms into innovations in procurement, logistics, and distribution	4.75	•	14	9
8.8	Firms into innovations in administration and management	4.15	•	14	8
8.9	Share of new-to-market (NTM) business process innovators	11.76	•	24	15
8.10	Firms with at least one type of business process innovation developed entirely in-house	76.19	•	24	15

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	24.06	•	10	7
Objectives					
9.1	Increase the firm's turnover	27.60	•	11	8
9.2	Increase market presence	29.38	•	10	7
9.3	Reduce costs	24.63	•	11	7
9.4	Product/process enhancement in terms of quality and quantity	25.22	•	10	6
9.5	Reduce environmental impacts	17.21	•	17	11
9.6	Improve health and safety of the firm's employees	17.21	•	14	8
9.7	Meet regulatory requirements (e.g., standards, etc.)	18.40	•	14	9
9.8	Catering to Corporate Social Responsibility	16.32	•	13	8
Outcomes					
9.9	Opened up new market opportunities	18.40	•	19	12
9.10	Responded to existing or forthcoming regulatory provisions	15.73	•	8	6
9.11	Responded to market pressures	18.10	•	17	11
9.12	Responded to cost pressures	18.69	•	11	7
9.13	Improved firm's turnover	18.40	•	18	12
9.14	Firms reporting turnover from new-to-market product innovations	34.69	•	19	14
9.15	Firms reporting turnover from NTM business process innovations	20.59	•	19	12
9.16	Turnover of an innovative firm (% of GSDP per capita)	90.72	•	2	2
9.17	Employment in innovative firms (as a percentage of total employment)	48.43	•	8	6
9.18	Firms that were granted IP rights	16.91	•	15	10
9.19	Firms that attained innovation outcomes through I4.0 technologies	2.97	•	19	11

States in the peer group based on similar GSDP per capita Kerala, Haryana, New Delhi, Telangana, Andhra Pradesh, Rajasthan Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation



Maharashtra

IMI
Overall
Rank 6

IMI
Score 31.38

Category

IMI Category Rank

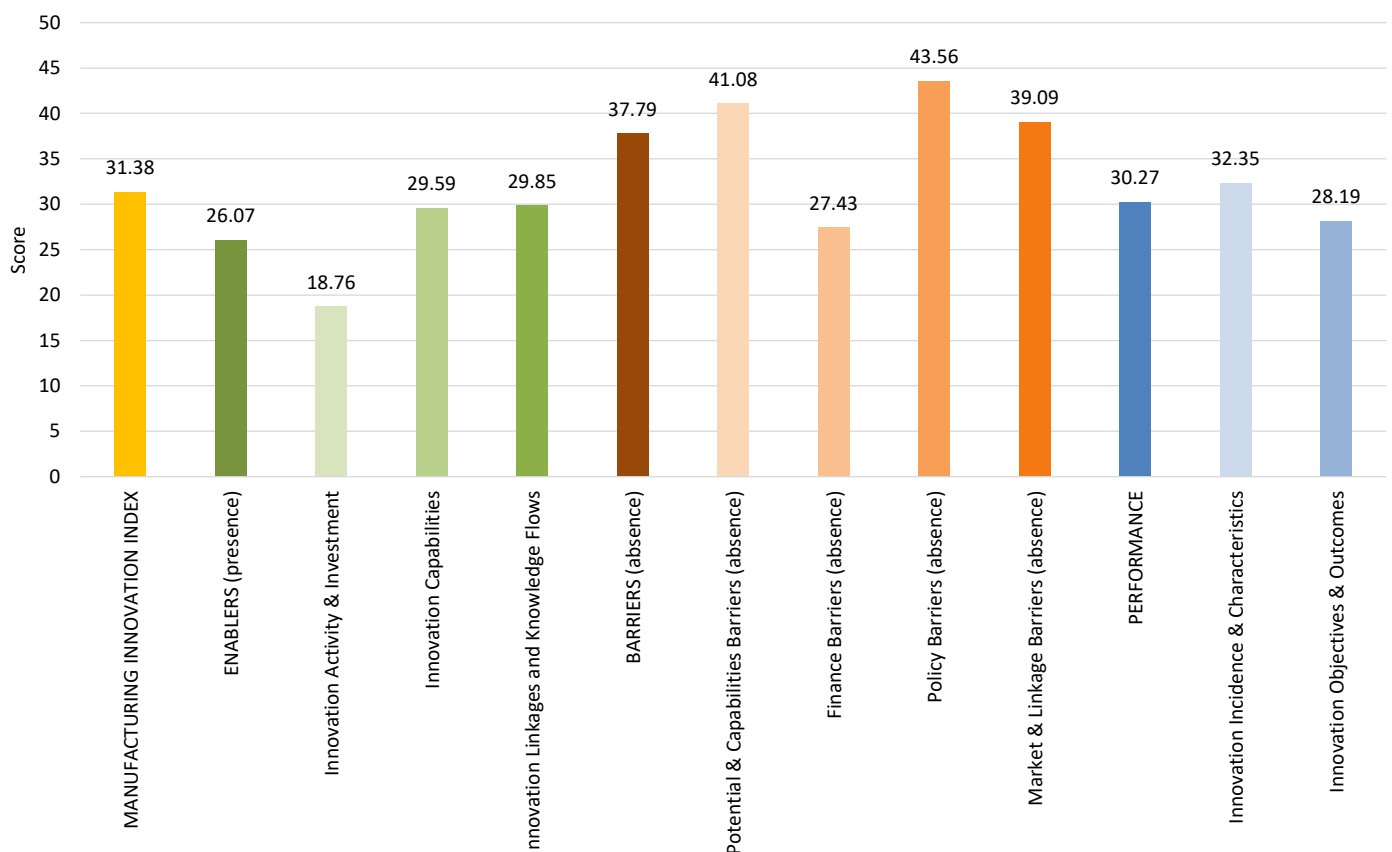
GSDP per capita (INR lakhs)

Major States

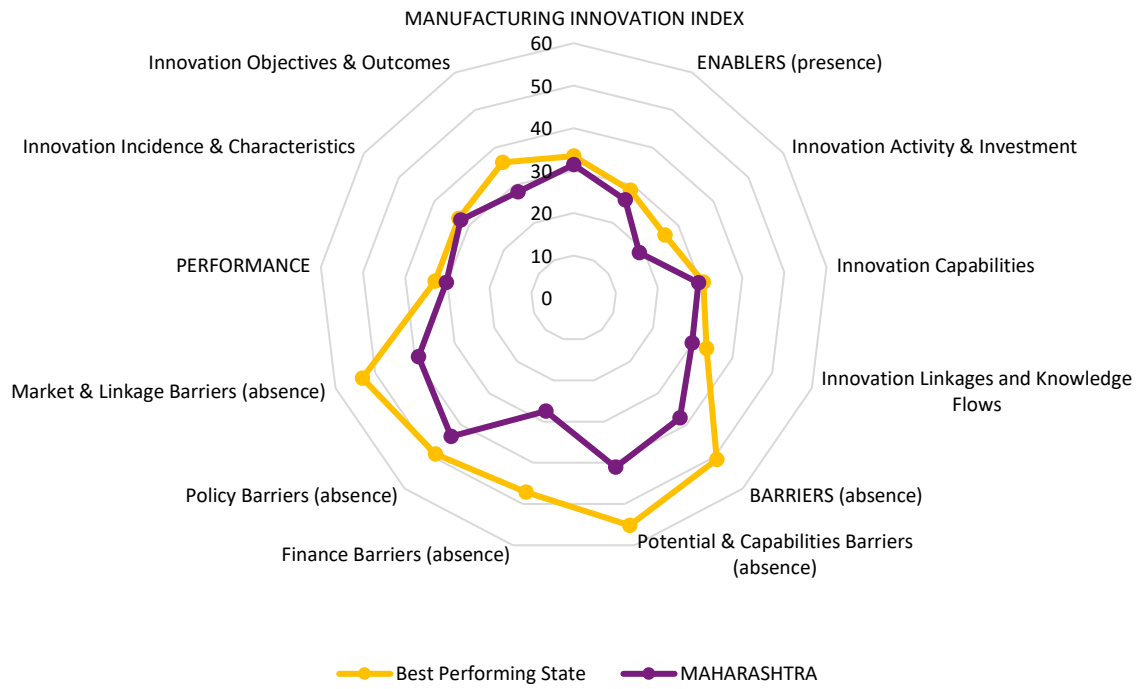
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1.45

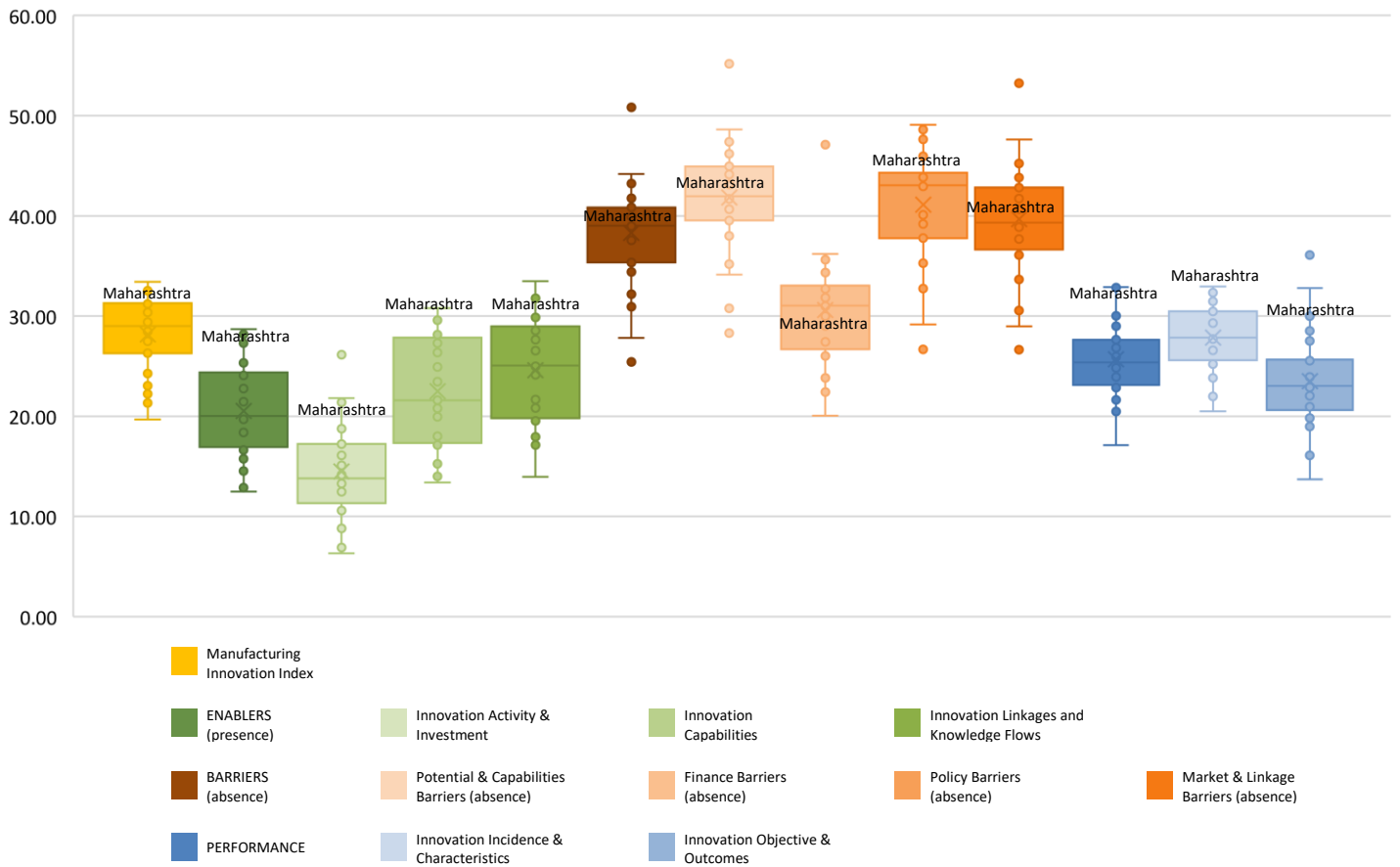
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

31.38

Peer Group Performance

•

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	26.07	•	4	3	Barriers (absence)	37.79	•	18	11	Performance	30.27	•	3	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	18.76	•	5	3
1.1	Firms engaging in tangible innovation input activities	10.39	•	6	5
1.2	Firms engaging in knowledge-based capital (intangible) activities	21.48	•	3	3
1.3	Firms investing in tangible activities	14.55	•	11	6
1.4	Firms investing in knowledge-based capital (intangible) activities	27.48	•	6	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	29.59	•	4	3
2.1	Firms with internal sources of financing	26.10	•	7	4
2.2	Firms with internal funding available for training	30.95	•	5	2
2.3	Firms with R&D Staff	17.32	•	6	1
2.4	Firms using innovative tools and practices among staff that are successful	17.32	•	7	4
2.5	Firms employing/ engaging experts in advanced digital tools in house	32.33	•	4	2
2.6	Firms employing highly qualified personnel, by level of educational attainment	40.65	•	3	1
2.7	Firms highly satisfied with innovation capabilities of employees	60.74	•	3	2
2.8	Firms using advanced, enabling or emerging technologies	11.09	•	3	2
2.9	Firms making use of internal information sources for innovation	46.88	•	4	3
2.10	Firms with an R&D strategy	21.48	•	4	3
2.11	Firms with an I4.0 strategy	7.62	•	1	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	29.85	•	5	3
3.1	Firms highly satisfied with investment climate in the state	60.51	•	6	4
3.2	Firms highly satisfied with ease of doing business in the state	61.43	•	9	5
3.3	Firms highly satisfied with govt. support for enabling innovation	50.12	•	4	2
3.4	Firms highly satisfied with innovation infrastructure in the state	51.96	•	9	5
3.5	Firms highly satisfied with innovation capabilities of external talent pool	41.57	•	2	1
3.6	Firms with formal cooperation agreements	7.39	•	3	2
3.7	Firms with informal cooperation agreements	5.54	•	13	10
3.8	Firms engaging experts in advanced digital tools from external sources	13.39	•	1	1
3.9	Firms selling products in international markets	28.41	•	6	6
3.10	Firms importing from international markets	11.78	•	8	5
3.11	Firms that collaborated with other parties on innovation activities within India	20.32	•	2	2
3.12	Firms that collaborated with other parties on innovation activities from abroad	5.77	•	4	2
3.13	Firms making use of external information sources for innovation	37.41	•	5	4
3.14	Firms with external sources of financing	6.93	•	9	6
3.15	Firms with external funding available for training	3.00	•	9	9

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	41.08	•	17	11
4.1	Innovation capabilities (R&D, design, etc.) insufficient	36.95	•	17	11
4.2	Organizational rigidities within the firm	43.65	•	16	11
4.3	No need due to prior innovations by this firm	45.27	•	16	11
4.4	Lack of qualified personnel	36.03	•	20	13
4.5	Lack of good ideas for innovations	45.50	•	14	9
4.6	Lack of firm-level infrastructure	39.95	•	18	12

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	27.43	•	19	12
5.1	Lack of funds within the firm or group	22.40	•	21	14
5.2	Lack of finance from sources outside the firm (credit)	27.71	•	21	14
5.3	Excessive perceived risks	31.64	•	19	12
5.4	Innovation costs too high	28.18	•	19	12

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	43.56	•	12	6
6.1	Regulations, standards, taxation	41.11	•	13	9

6.2	Weakness of intellectual property rights	47.11	•	16	10
6.3	Legislative barriers	42.49	•	6	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	39.09	•	16	10
7.1	Lack of information on markets	38.57	•	16	10
7.2	Deficiencies in the availability of external services	39.72	•	13	8
7.3	Difficulty in finding cooperation partners	41.11	•	16	9
7.4	Lack of information on technology	36.26	•	22	15
7.5	Market dominated by established firms	37.41	•	16	11
7.6	No need due to very little competition in firm's market	47.11	•	16	10
7.7	Uncertain demand for innovative goods or services	35.80	•	16	11
7.8	Low demand for innovations in your market	37.41	•	11	7

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	32.35	•	2	2
8.1	Firms with new or significantly improved goods	19.17	•	4	3
8.2	Firms with new or significantly improved services	9.01	•	1	1
8.3	Share of new-to-market (NTM) product innovators	45.65	•	13	8
8.4	Firms with at least one type of product innovation developed entirely in-house	94.57	•	18	13
8.5	Firms into innovations in operations and product/process development	12.24	•	12	9
8.6	Firms into innovations in marketing and Sales	10.85	•	4	3
8.7	Firms into innovations in procurement, logistics, and distribution	7.62	•	7	5
8.8	Firms into innovations in administration and management	5.77	•	6	3
8.9	Share of new-to-market (NTM) business process innovators	33.96	•	3	2
8.10	Firms with at least one type of business process innovation developed entirely in-house	94.67	•	1	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	28.19	•	5	4
Objectives					
9.1	Increase the firm's turnover	33.72	•	5	4
9.2	Increase market presence	37.41	•	6	4
9.3	Reduce costs	30.25	•	6	4
9.4	Product/process enhancement in terms of quality and quantity	31.64	•	5	4
9.5	Reduce environmental impacts	26.33	•	3	3
9.6	Improve health and safety of the firm's employees	24.71	•	4	3
9.7	Meet regulatory requirements (e.g., standards, etc.)	23.56	•	5	4
9.8	Catering to Corporate Social Responsibility	22.63	•	4	3
Outcomes					
9.9	Opened up new market opportunities	25.87	•	4	4
9.10	Responded to existing or forthcoming regulatory provisions	15.70	•	9	7
9.11	Responded to market pressures	23.79	•	6	4
9.12	Responded to cost pressures	23.33	•	5	4
9.13	Improved firm's turnover	27.25	•	4	4
9.14	Firms reporting turnover from new-to-market product innovations	46.74	•	10	8
9.15	Firms reporting turnover from NTM business process innovations	24.53	•	13	7
9.16	Turnover of an innovative firm (% of GSDP per capita)	35.68	•	17	12
9.17	Employment in innovative firms (as a percentage of total employment)	44.80	•	11	8
9.18	Firms that were granted IP rights	21.48	•	4	1
9.19	Firms that attained innovation outcomes through I4.0 technologies	9.01	•	1	1

States in the peer group based on similar GSDP per capita Tamil Nadu, Gujarat, Uttar Pradesh, Karnataka, West Bengal, Rajasthan Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation

New Delhi

IMII
Overall
Rank **9**

IMII
Score **30.55**

Category

City and UT States

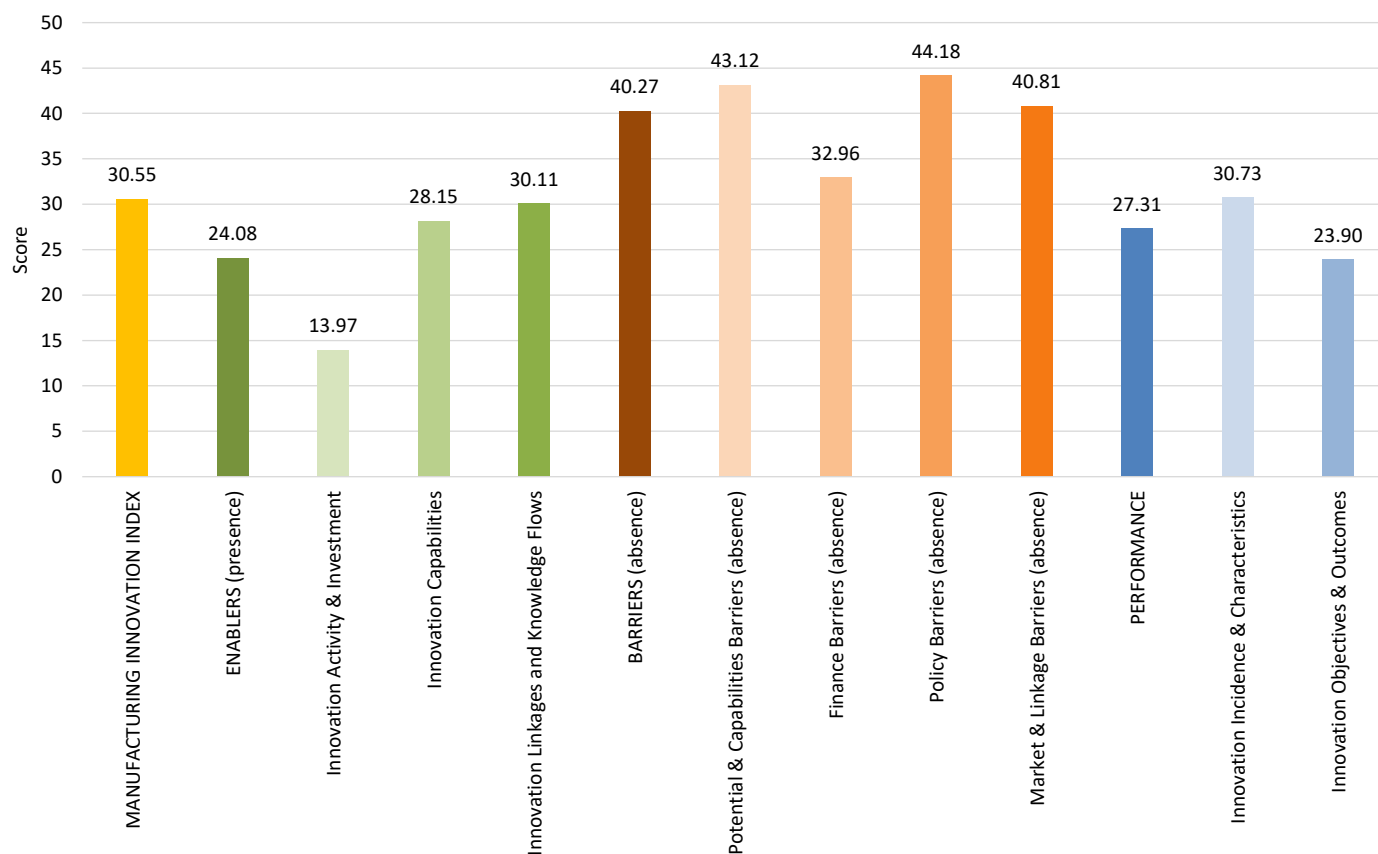
IMII Category Rank

3

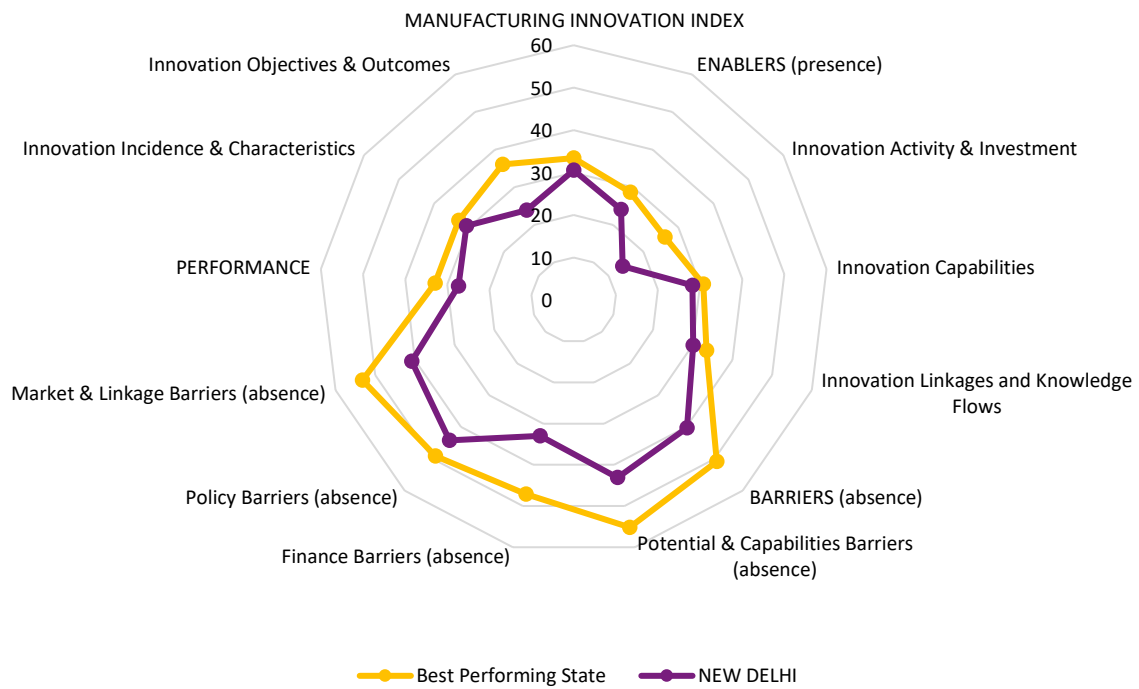
GSDP per capita (INR lakhs)

2.60

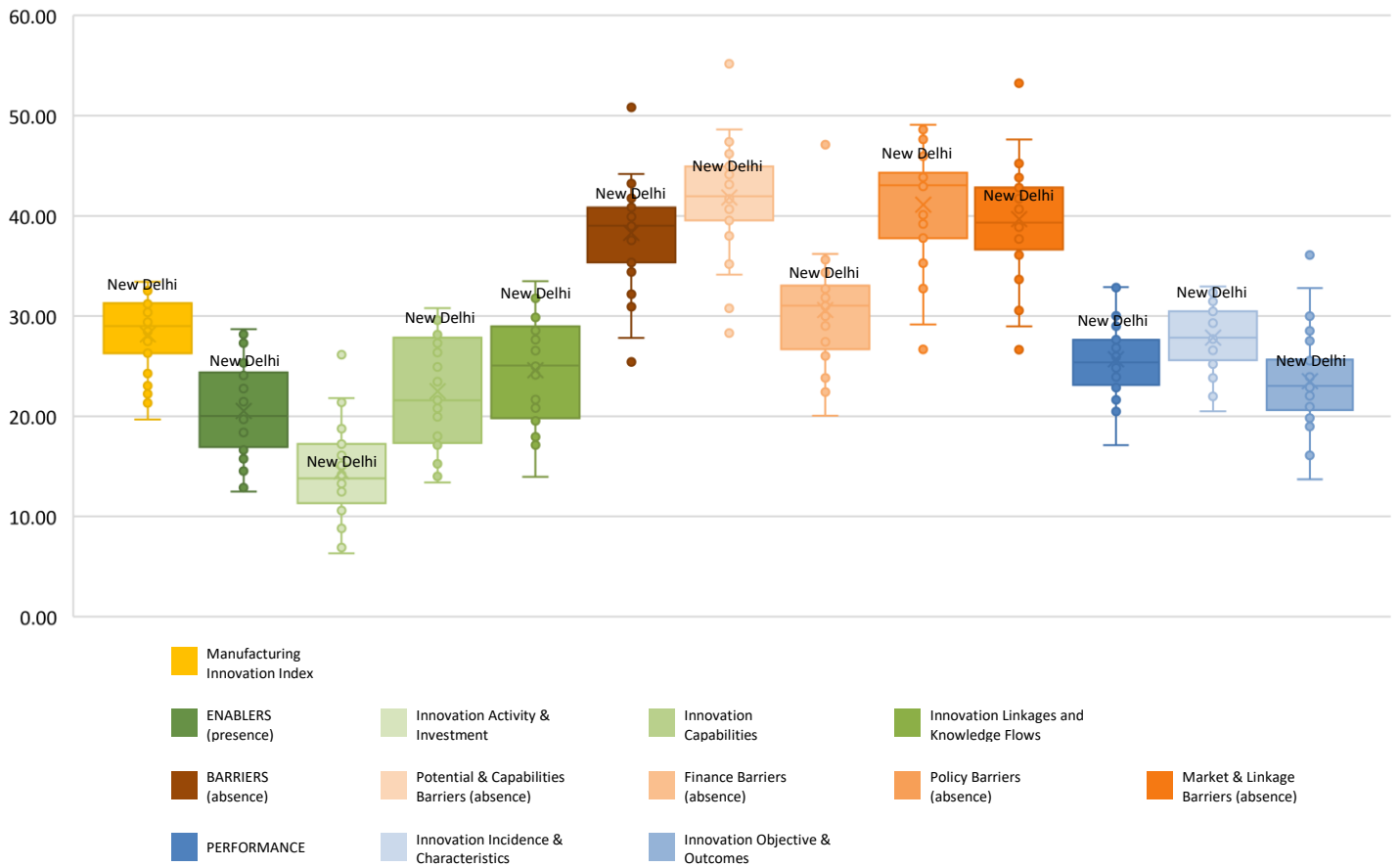
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

30.55

Peer Group Performance

•

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	24.08	•	8	3	Barriers (absence)	40.27	•	10	2	Performance	27.31	•	10	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	13.97	•	13	4
1.1	Firms engaging in tangible innovation input activities	6.29	•	19	5
1.2	Firms engaging in knowledge-based capital (intangible) activities	15.87	•	8	3
1.3	Firms investing in tangible activities	9.28	•	26	5
1.4	Firms investing in knowledge-based capital (intangible) activities	23.05	•	12	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	28.15	•	6	2
2.1	Firms with internal sources of financing	22.75	•	13	4
2.2	Firms with internal funding available for training	28.14	•	9	4
2.3	Firms with R&D Staff	16.17	•	7	4
2.4	Firms using innovative tools and practices among staff that are successful	18.56	•	4	2
2.5	Firms employing/ engaging experts in advanced digital tools in house	30.24	•	5	3
2.6	Firms employing highly qualified personnel, by level of educational attainment	45.21	•	2	2
2.7	Firms highly satisfied with innovation capabilities of employees	54.79	•	9	3
2.8	Firms using advanced, enabling or emerging technologies	12.28	•	2	1
2.9	Firms making use of internal information sources for innovation	43.41	•	6	2
2.10	Firms with an R&D strategy	14.97	•	12	4
2.11	Firms with an I4.0 strategy	7.19	•	2	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	30.11	•	4	2
3.1	Firms highly satisfied with investment climate in the state	62.87	•	3	2
3.2	Firms highly satisfied with ease of doing business in the state	64.37	•	3	2
3.3	Firms highly satisfied with govt. support for enabling innovation	51.50	•	3	2
3.4	Firms highly satisfied with innovation infrastructure in the state	58.38	•	3	2
3.5	Firms highly satisfied with innovation capabilities of external talent pool	39.82	•	5	2
3.6	Firms with formal cooperation agreements	4.79	•	6	3
3.7	Firms with informal cooperation agreements	6.59	•	5	1
3.8	Firms engaging experts in advanced digital tools from external sources	9.88	•	11	4
3.9	Firms selling products in international markets	25.15	•	12	3
3.10	Firms importing from international markets	14.97	•	3	1
3.11	Firms that collaborated with other parties on innovation activities within India	16.17	•	10	4
3.12	Firms that collaborated with other parties on innovation activities from abroad	4.19	•	12	3
3.13	Firms making use of external information sources for innovation	33.83	•	9	3
3.14	Firms with external sources of financing	7.19	•	7	1
3.15	Firms with external funding available for training	2.69	•	11	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	43.12	•	12	2
4.1	Innovation capabilities (R&D, design, etc.) insufficient	37.72	•	14	3
4.2	Organizational rigidities within the firm	42.81	•	18	4
4.3	No need due to prior innovations by this firm	47.01	•	11	2
4.4	Lack of qualified personnel	38.92	•	12	2
4.5	Lack of good ideas for innovations	46.11	•	10	2
4.6	Lack of firm-level infrastructure	46.41	•	6	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	32.96	•	8	2
5.1	Lack of funds within the firm or group	29.04	•	8	2
5.2	Lack of finance from sources outside the firm (credit)	33.53	•	9	2
5.3	Excessive perceived risks	36.23	•	11	2
5.4	Innovation costs too high	33.23	•	8	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	44.18	•	8	3
6.1	Regulations, standards, taxation	40.72	•	14	3

6.2	Weakness of intellectual property rights	50.60	•	9	3
6.3	Legislative barriers	41.32	•	8	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	40.81	•	12	2
7.1	Lack of information on markets	38.32	•	18	4
7.2	Deficiencies in the availability of external services	39.52	•	14	3
7.3	Difficulty in finding cooperation partners	42.81	•	14	4
7.4	Lack of information on technology	39.52	•	15	3
7.5	Market dominated by established firms	39.82	•	14	2
7.6	No need due to very little competition in firm's market	50.30	•	11	3
7.7	Uncertain demand for innovative goods or services	38.92	•	7	2
7.8	Low demand for innovations in your market	39.22	•	6	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	30.73	•	5	1
8.1	Firms with new or significantly improved goods	14.37	•	12	4
8.2	Firms with new or significantly improved services	6.59	•	4	2
8.3	Share of new-to-market (NTM) product innovators	55.36	•	4	1
8.4	Firms with at least one type of product innovation developed entirely in-house	92.86	•	23	4
8.5	Firms into innovations in operations and product/process development	9.28	•	19	5
8.6	Firms into innovations in marketing and Sales	7.19	•	9	4
8.7	Firms into innovations in procurement, logistics, and distribution	6.29	•	8	3
8.8	Firms into innovations in administration and management	5.39	•	7	3
8.9	Share of new-to-market (NTM) business process innovators	29.03	•	5	1
8.10	Firms with at least one type of business process innovation developed entirely in-house	90.91	•	2	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	23.90	•	11	3
Objectives					
9.1	Increase the firm's turnover	26.95	•	12	3
9.2	Increase market presence	29.34	•	11	3
9.3	Reduce costs	24.25	•	12	4
9.4	Product/process enhancement in terms of quality and quantity	25.15	•	11	4
9.5	Reduce environmental impacts	20.96	•	11	4
9.6	Improve health and safety of the firm's employees	19.46	•	11	4
9.7	Meet regulatory requirements (e.g., standards, etc.)	20.06	•	10	4
9.8	Catering to Corporate Social Responsibility	18.56	•	8	2
Outcomes					
9.9	Opened up new market opportunities	20.96	•	10	3
9.10	Responded to existing or forthcoming regulatory provisions	16.47	•	5	1
9.11	Responded to market pressures	20.66	•	9	2
9.12	Responded to cost pressures	20.66	•	9	3
9.13	Improved firm's turnover	21.26	•	12	4
9.14	Firms reporting turnover from new-to-market product innovations	41.07	•	15	2
9.15	Firms reporting turnover from NTM business process innovations	25.81	•	10	2
9.16	Turnover of an innovative firm (% of GSDP per capita)	28.45	•	21	3
9.17	Employment in innovative firms (as a percentage of total employment)	50.52	•	19	4
9.18	Firms that were granted IP rights	38.75	•	3	2
9.19	Firms that attained innovation outcomes through I4.0 technologies	8.98	•	2	1

States in the peer group based on similar GSDP per capita
Madhya Pradesh, Telangana, Kerala, Haryana, Andhra Pradesh, Rajasthan
Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation



North Eastern States (Excluding Assam)

IMI
Overall
Rank

27

IMI
Score

19.69

Category

Hill States

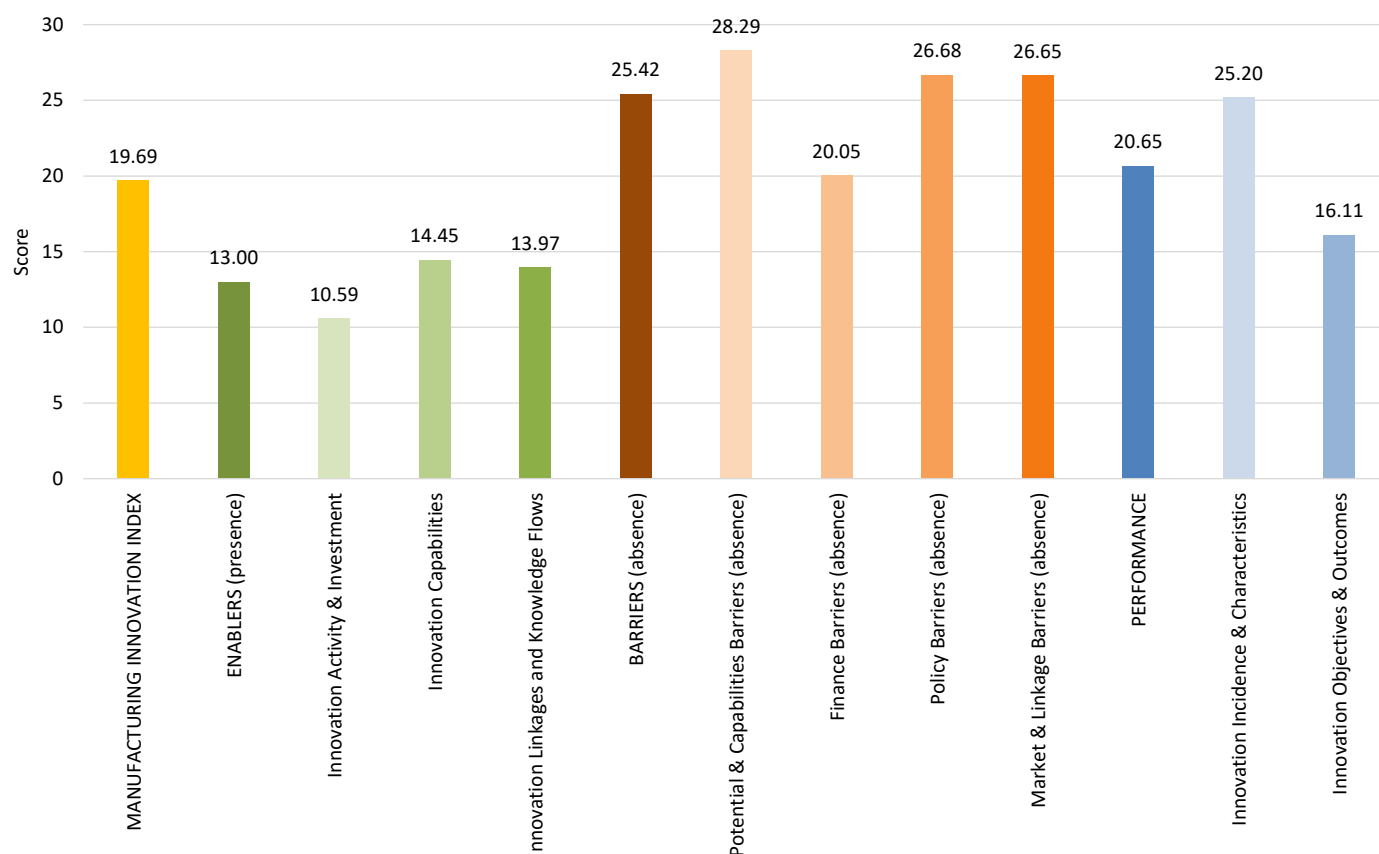
IMI Category Rank

4

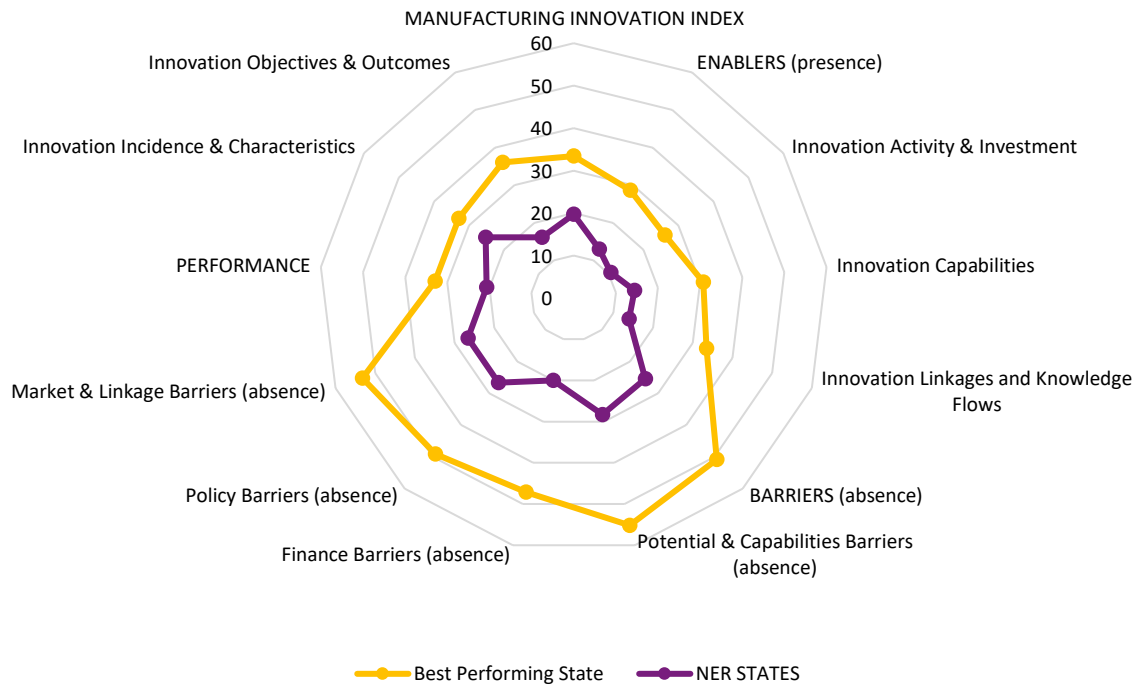
GSDP per capita (INR lakhs)

2.10

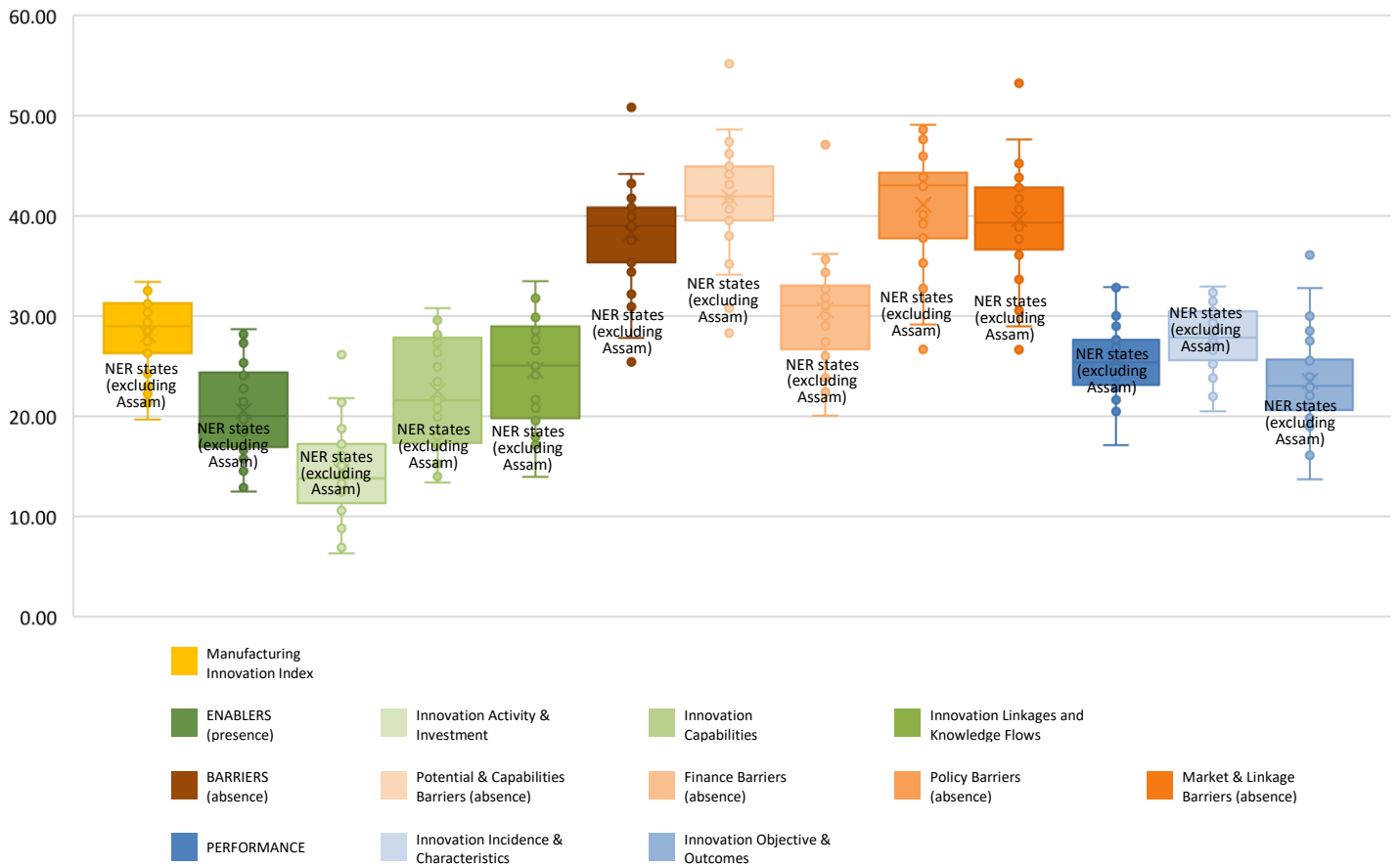
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

19.69

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	13.00	•	25	4

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Barriers (absence)	25.42	•	27	4

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Performance	20.65	•	25	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	10.59	•	24	4
1.1	Firms engaging in tangible innovation input activities	9.92	•	8	1
1.2	Firms engaging in knowledge-based capital (intangible) activities	9.16	•	22	4
1.3	Firms investing in tangible activities	12.98	•	17	3
1.4	Firms investing in knowledge-based capital (intangible) activities	10.69	•	25	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	14.45	•	25	4
2.1	Firms with internal sources of financing	14.50	•	24	3
2.2	Firms with internal funding available for training	9.92	•	27	4
2.3	Firms with R&D Staff	6.87	•	25	4
2.4	Firms using innovative tools and practices among staff that are successful	12.98	•	14	3
2.5	Firms employing/ engaging experts in advanced digital tools in house	9.92	•	27	4
2.6	Firms employing highly qualified personnel, by level of educational attainment	26.72	•	18	3
2.7	Firms highly satisfied with innovation capabilities of employees	34.35	•	27	4
2.8	Firms using advanced, enabling or emerging technologies	2.29	•	25	4
2.9	Firms making use of internal information sources for innovation	22.14	•	27	4
2.10	Firms with an R&D strategy	3.05	•	27	4
2.11	Firms with an I4.0 strategy	0.76	•	25	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	13.97	•	27	4
3.1	Firms highly satisfied with investment climate in the state	25.95	•	27	4
3.2	Firms highly satisfied with ease of doing business in the state	25.95	•	27	4
3.3	Firms highly satisfied with govt. support for enabling innovation	22.90	•	27	4
3.4	Firms highly satisfied with innovation infrastructure in the state	26.72	•	27	4
3.5	Firms highly satisfied with innovation capabilities of external talent pool	19.08	•	27	4
3.6	Firms with formal cooperation agreements	0.00	•	27	4
3.7	Firms with informal cooperation agreements	4.58	•	18	3
3.8	Firms engaging experts in advanced digital tools from external sources	3.82	•	22	3
3.9	Firms selling products in international markets	9.92	•	24	4
3.10	Firms importing from international markets	3.05	•	24	4
3.11	Firms that collaborated with other parties on innovation activities within India	11.45	•	20	3
3.12	Firms that collaborated with other parties on innovation activities from abroad	1.53	•	22	4
3.13	Firms making use of external information sources for innovation	23.66	•	26	4
3.14	Firms with external sources of financing	9.16	•	3	1
3.15	Firms with external funding available for training	1.53	•	20	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	28.29	•	27	4
4.1	Innovation capabilities (R&D, design, etc.) insufficient	25.19	•	27	4
4.2	Organizational rigidities within the firm	32.06	•	26	4
4.3	No need due to prior innovations by this firm	32.82	•	27	4
4.4	Lack of qualified personnel	26.72	•	27	4
4.5	Lack of good ideas for innovations	29.01	•	27	4
4.6	Lack of firm-level infrastructure	24.43	•	27	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	20.05	•	27	4
5.1	Lack of funds within the firm or group	17.56	•	27	4
5.2	Lack of finance from sources outside the firm (credit)	21.37	•	27	4
5.3	Excessive perceived risks	22.90	•	27	4
5.4	Innovation costs too high	18.32	•	27	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	26.68	•	27	4
6.1	Regulations, standards, taxation	22.90	•	27	4

Peer Group Performance

•

6.2	Weakness of intellectual property rights	34.35	•	27	4
6.3	Legislative barriers	22.90	•	26	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	26.65	•	27	4
7.1	Lack of information on markets	24.43	•	27	4
7.2	Deficiencies in the availability of external services	24.43	•	27	4
7.3	Difficulty in finding cooperation partners	29.01	•	27	4
7.4	Lack of information on technology	23.66	•	27	4
7.5	Market dominated by established firms	27.48	•	26	4
7.6	No need due to very little competition in firm's market	34.35	•	26	4
7.7	Uncertain demand for innovative goods or services	27.48	•	26	4
7.8	Low demand for innovations in your market	25.19	•	25	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	25.20	•	24	4
8.1	Firms with new or significantly improved goods	11.45	•	18	3
8.2	Firms with new or significantly improved services	0.76	•	19	3
8.3	Share of new-to-market (NTM) product innovators	33.33	•	8	2
8.4	Firms with at least one type of product innovation developed entirely in-house	93.33	•	18	3
8.5	Firms into innovations in operations and product/process development	11.45	•	27	4
8.6	Firms into innovations in marketing and Sales	6.11	•	14	3
8.7	Firms into innovations in procurement, logistics, and distribution	3.82	•	21	4
8.8	Firms into innovations in administration and management	5.34	•	21	4
8.9	Share of new-to-market (NTM) business process innovators	13.33	•	9	2
8.10	Firms with at least one type of business process innovation developed entirely in-house	83.33	•	22	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	16.11	•	26	4
Objectives					
9.1	Increase the firm's turnover	19.08	•	25	4
9.2	Increase market presence	23.66	•	23	3
9.3	Reduce costs	16.03	•	25	4
9.4	Product/process enhancement in terms of quality and quantity	16.79	•	25	4
9.5	Reduce environmental impacts	11.45	•	26	4
9.6	Improve health and safety of the firm's employees	11.45	•	25	4
9.7	Meet regulatory requirements (e.g., standards, etc.)	12.21	•	26	4
9.8	Catering to Corporate Social Responsibility	9.92	•	26	4
Outcomes					
9.9	Opened up new market opportunities	14.50	•	21	3
9.10	Responded to existing or forthcoming regulatory provisions	6.11	•	26	4
9.11	Responded to market pressures	13.74	•	20	3
9.12	Responded to cost pressures	12.21	•	22	3
9.13	Improved firm's turnover	14.50	•	20	3
9.14	Firms reporting turnover from new-to-market product innovations	33.33	•	21	3
9.15	Firms reporting turnover from NTM business process innovations	6.67	•	26	4
9.16	Turnover of an innovative firm (% of GSDP per capita)	25.49	•	25	4
9.17	Employment in innovative firms (as a percentage of total employment)	45.45	•	10	2
9.18	Firms that were granted IP rights	12.98	•	20	4
9.19	Firms that attained innovation outcomes through I4.0 technologies	14.50	•	25	4

States in the peer group based on similar GSDP per capita

Puducherry, Chandigarh, Goa, Himachal Pradesh, Jammu & Kashmir, Uttarakhand

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation

Odisha

IMI
Overall
Rank

23

IMI
Score

23.05

Category

IMI Category Rank

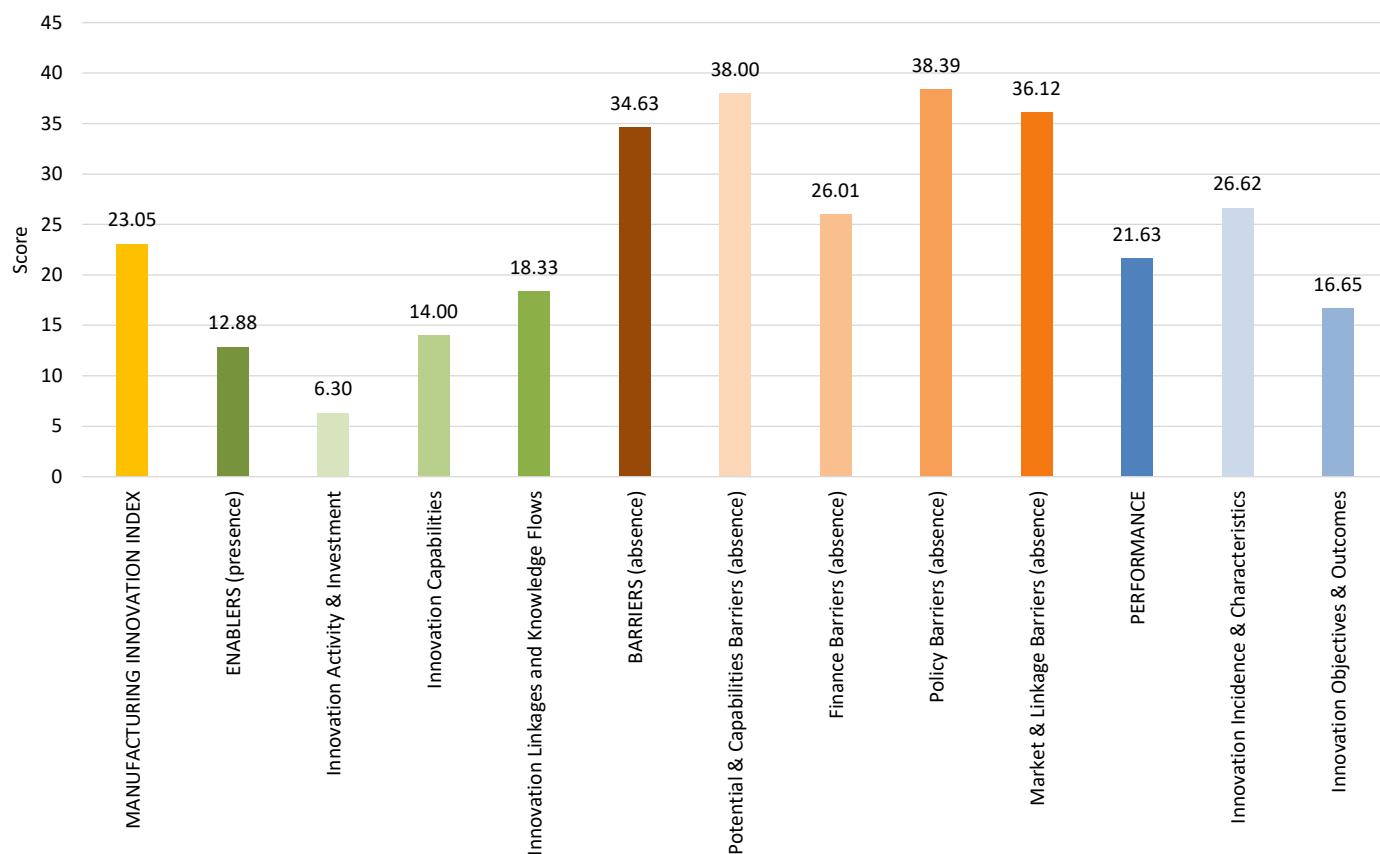
GSDP per capita (INR lakhs)

Major States

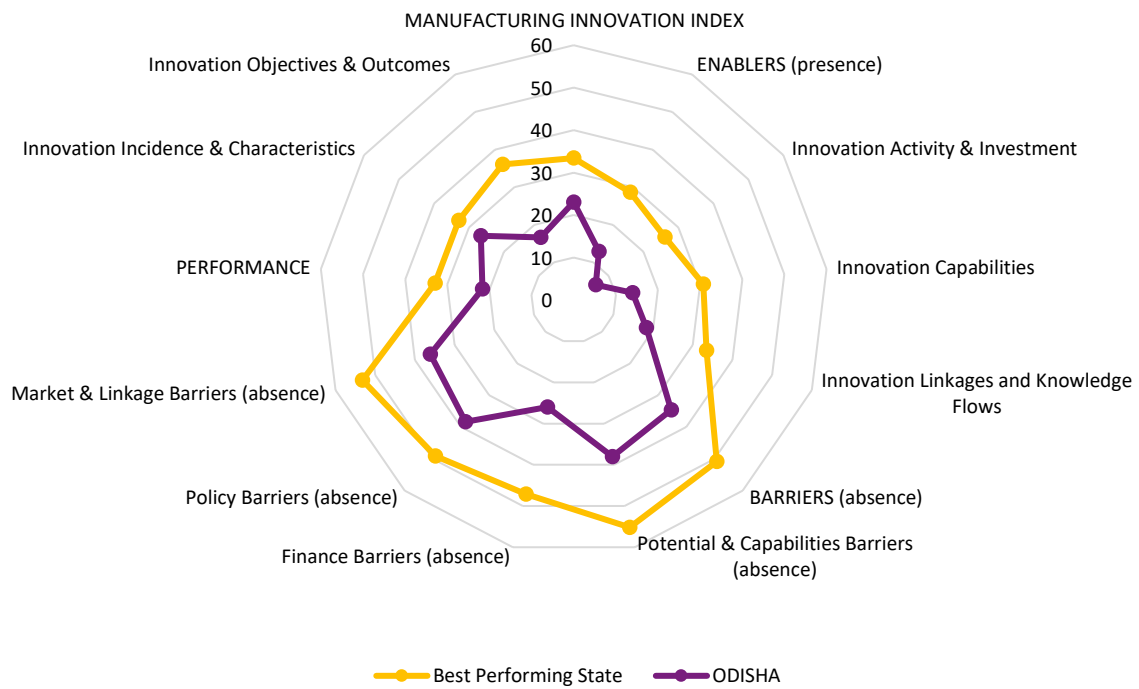
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0.76

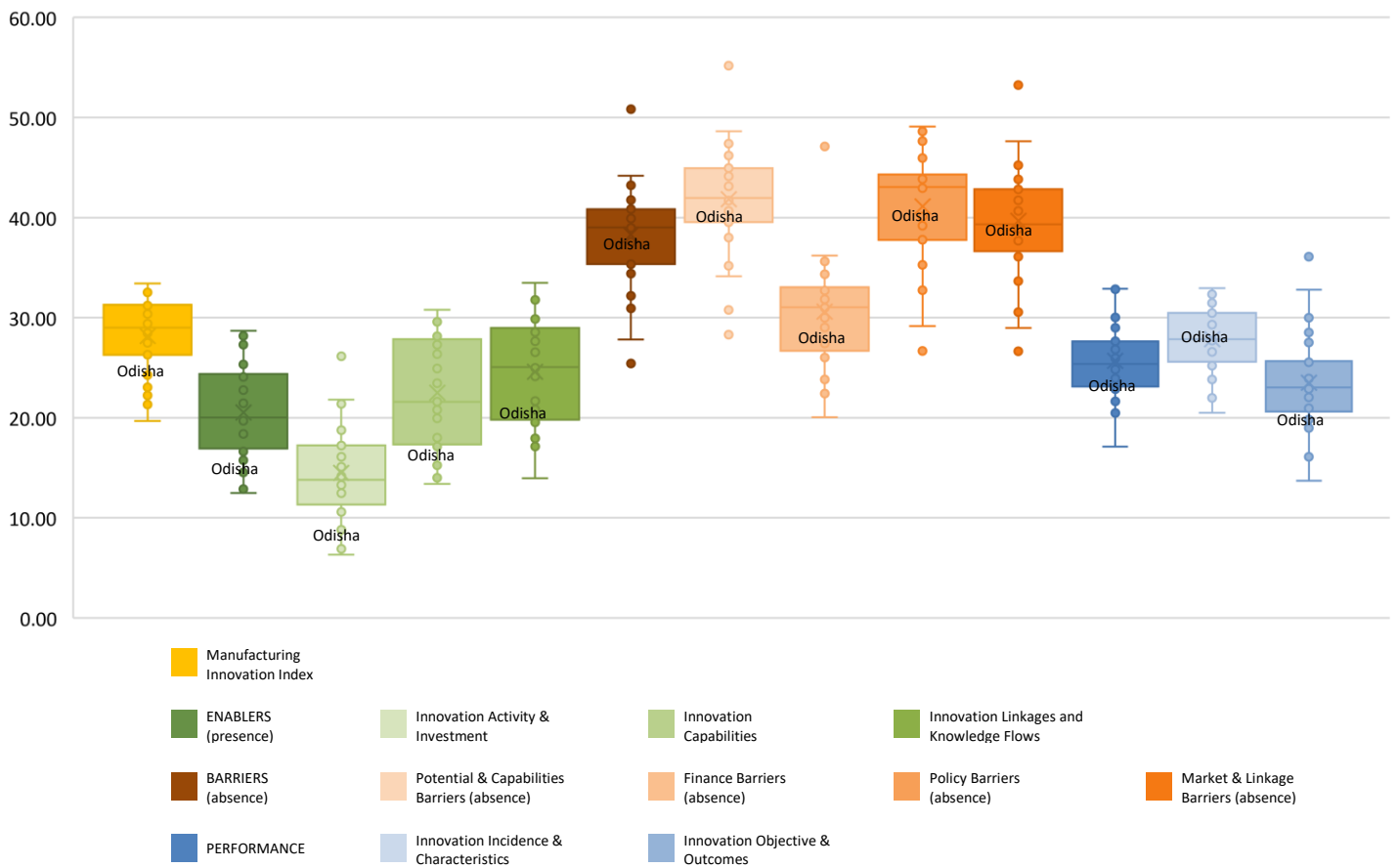
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

23.05

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	12.88	•	26	17

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Barriers (absence)	34.63	•	22	15

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	6.30	•	27	18
1.1	Firms engaging in tangible innovation input activities	1.92	•	27	18
1.2	Firms engaging in knowledge-based capital (intangible) activities	5.11	•	27	18
1.3	Firms investing in tangible activities	10.22	•	24	16
1.4	Firms investing in knowledge-based capital (intangible) activities	8.63	•	26	17

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	14.00	•	26	17
2.1	Firms with internal sources of financing	11.18	•	27	18
2.2	Firms with internal funding available for training	11.82	•	26	18
2.3	Firms with R&D Staff	8.31	•	22	14
2.4	Firms using innovative tools and practices among staff that are successful	4.47	•	27	18
2.5	Firms employing/ engaging experts in advanced digital tools in house	13.74	•	22	14
2.6	Firms employing highly qualified personnel, by level of educational attainment	24.28	•	21	13
2.7	Firms highly satisfied with innovation capabilities of employees	38.66	•	24	17
2.8	Firms using advanced, enabling or emerging technologies	0.64	•	27	18
2.9	Firms making use of internal information sources for innovation	24.92	•	24	16
2.10	Firms with an R&D strategy	3.51	•	26	18
2.11	Firms with an I4.0 strategy	0.32	•	26	17

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	18.33	•	24	17
3.1	Firms highly satisfied with investment climate in the state	38.66	•	25	17
3.2	Firms highly satisfied with ease of doing business in the state	42.81	•	24	16
3.3	Firms highly satisfied with govt. support for enabling innovation	32.59	•	22	15
3.4	Firms highly satisfied with innovation infrastructure in the state	37.06	•	22	15
3.5	Firms highly satisfied with innovation capabilities of external talent pool	28.12	•	19	13
3.6	Firms with formal cooperation agreements	1.28	•	26	18
3.7	Firms with informal cooperation agreements	7.03	•	4	4
3.8	Firms engaging experts in advanced digital tools from external sources	1.60	•	26	17
3.9	Firms selling products in international markets	7.35	•	25	16
3.10	Firms importing from international markets	1.92	•	25	16
3.11	Firms that collaborated with other parties on innovation activities within India	11.50	•	19	13
3.12	Firms that collaborated with other parties on innovation activities from abroad	1.28	•	24	15
3.13	Firms making use of external information sources for innovation	22.68	•	27	18
3.14	Firms with external sources of financing	2.56	•	26	18
3.15	Firms with external funding available for training	0.64	•	26	18

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	38.00	•	23	16
4.1	Innovation capabilities (R&D, design, etc.) insufficient	34.82	•	23	16
4.2	Organizational rigidities within the firm	39.94	•	23	16
4.3	No need due to prior innovations by this firm	38.98	•	23	16
4.4	Lack of qualified personnel	35.14	•	21	14
4.5	Lack of good ideas for innovations	40.89	•	21	14
4.6	Lack of firm-level infrastructure	38.66	•	21	14

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	26.01	•	24	17
5.1	Lack of funds within the firm or group	20.77	•	25	18
5.2	Lack of finance from sources outside the firm (credit)	27.48	•	22	15
5.3	Excessive perceived risks	30.99	•	20	13
5.4	Innovation costs too high	24.92	•	24	17

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	38.39	•	20	13
6.1	Regulations, standards, taxation	38.98	•	20	13

Peer Group Performance

•

6.2	Weakness of intellectual property rights	42.81	•	23	16
6.3	Legislative barriers	33.55	•	15	10

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	36.12	•	22	15
7.1	Lack of information on markets	38.34	•	17	11
7.2	Deficiencies in the availability of external services	36.10	•	21	14
7.3	Difficulty in finding cooperation partners	39.94	•	19	12
7.4	Lack of information on technology	36.42	•	20	13
7.5	Market dominated by established firms	36.74	•	20	13
7.6	No need due to very little competition in firm's market	43.13	•	23	16
7.7	Uncertain demand for innovative goods or services	31.63	•	24	16
7.8	Low demand for innovations in your market	27.48	•	23	16

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	26.62	•	17	16
8.1	Firms with new or significantly improved goods	6.07	•	24	15
8.2	Firms with new or significantly improved services	0.96	•	25	17
8.3	Share of new-to-market (NTM) product innovators	55.00	•	5	2
8.4	Firms with at least one type of product innovation developed entirely in-house	100.00	•	6	3
8.5	Firms into innovations in operations and product/process development	6.39	•	26	18
8.6	Firms into innovations in marketing and Sales	1.92	•	27	18
8.7	Firms into innovations in procurement, logistics, and distribution	1.60	•	26	17
8.8	Firms into innovations in administration and management	1.28	•	27	18
8.9	Share of new-to-market (NTM) business process innovators	20.00	•	14	9
8.10	Firms with at least one type of business process innovation developed entirely in-house	78.26	•	21	13

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	16.65	•	25	17
Objectives					
9.1	Increase the firm's turnover	13.10	•	27	18
9.2	Increase market presence	15.97	•	27	18
9.3	Reduce costs	12.14	•	27	18
9.4	Product/process enhancement in terms of quality and quantity	15.02	•	27	18
9.5	Reduce environmental impacts	10.86	•	27	18
9.6	Improve health and safety of the firm's employees	10.86	•	26	17
9.7	Meet regulatory requirements (e.g., standards, etc.)	10.86	•	27	18
9.8	Catering to Corporate Social Responsibility	10.22	•	25	17
Outcomes					
9.9	Opened up new market opportunities	11.18	•	26	17
9.10	Responded to existing or forthcoming regulatory provisions	9.90	•	22	15
9.11	Responded to market pressures	11.18	•	25	16
9.12	Responded to cost pressures	11.18	•	24	16
9.13	Improved firm's turnover	11.50	•	26	17
9.14	Firms reporting turnover from new-to-market product innovations	55.00	•	4	3
9.15	Firms reporting turnover from NTM business process innovations	20.00	•	20	13
9.16	Turnover of an innovative firm (% of GSDP per capita)	63.41	•	7	6
9.17	Employment in innovative firms (as a percentage of total employment)	30.25	•	26	17
9.18	Firms that were granted IP rights	12.46	•	22	13
9.19	Firms that attained innovation outcomes through I4.0 technologies	0.64	•	26	17

States in the peer group based on similar GSDP per capita
Punjab, Bihar, Haryana, Kerala, Chhattisgarh, Madhya Pradesh

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation

Puducherry

IMI
Overall
Rank

7

IMI
Score

31.29

Category

UT and City States

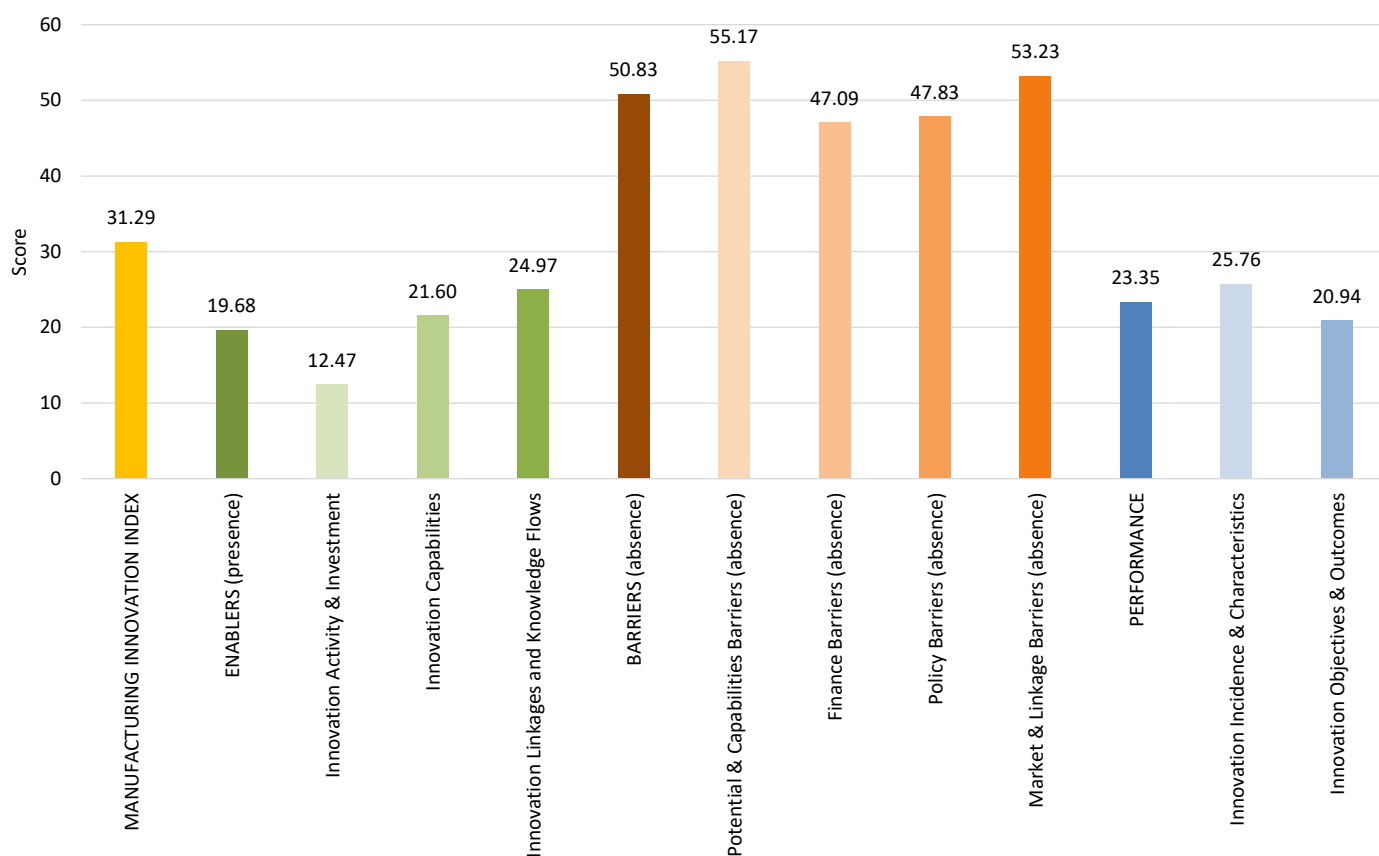
IMI Category Rank

2

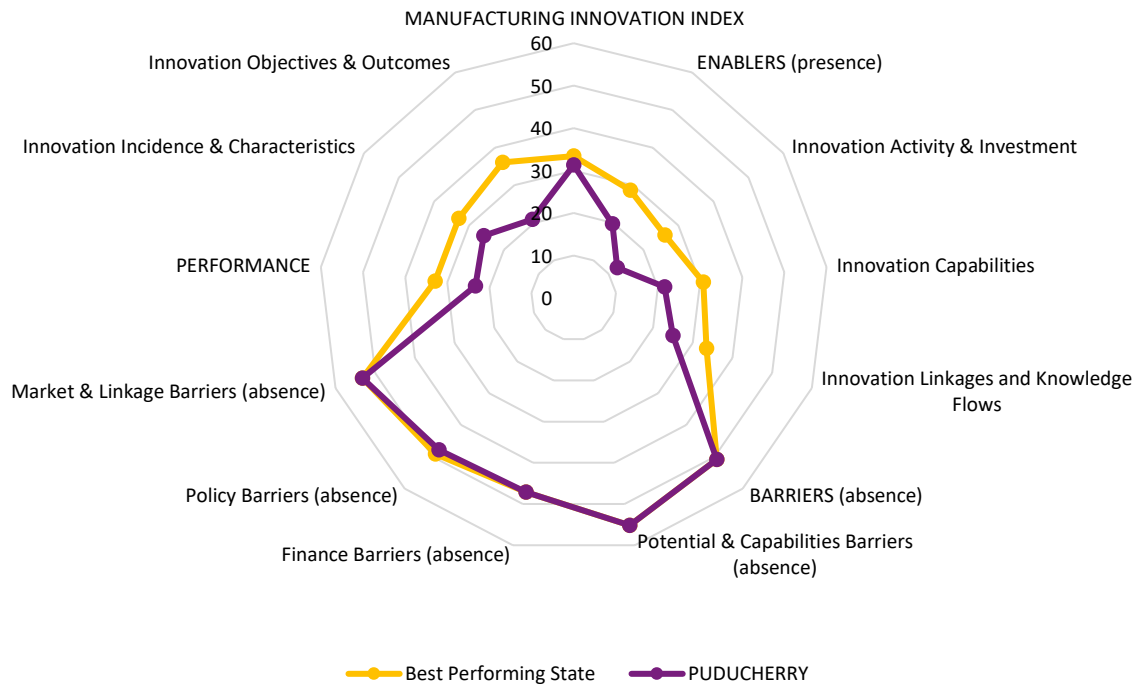
GSDP per capita (INR lakhs)

1.54

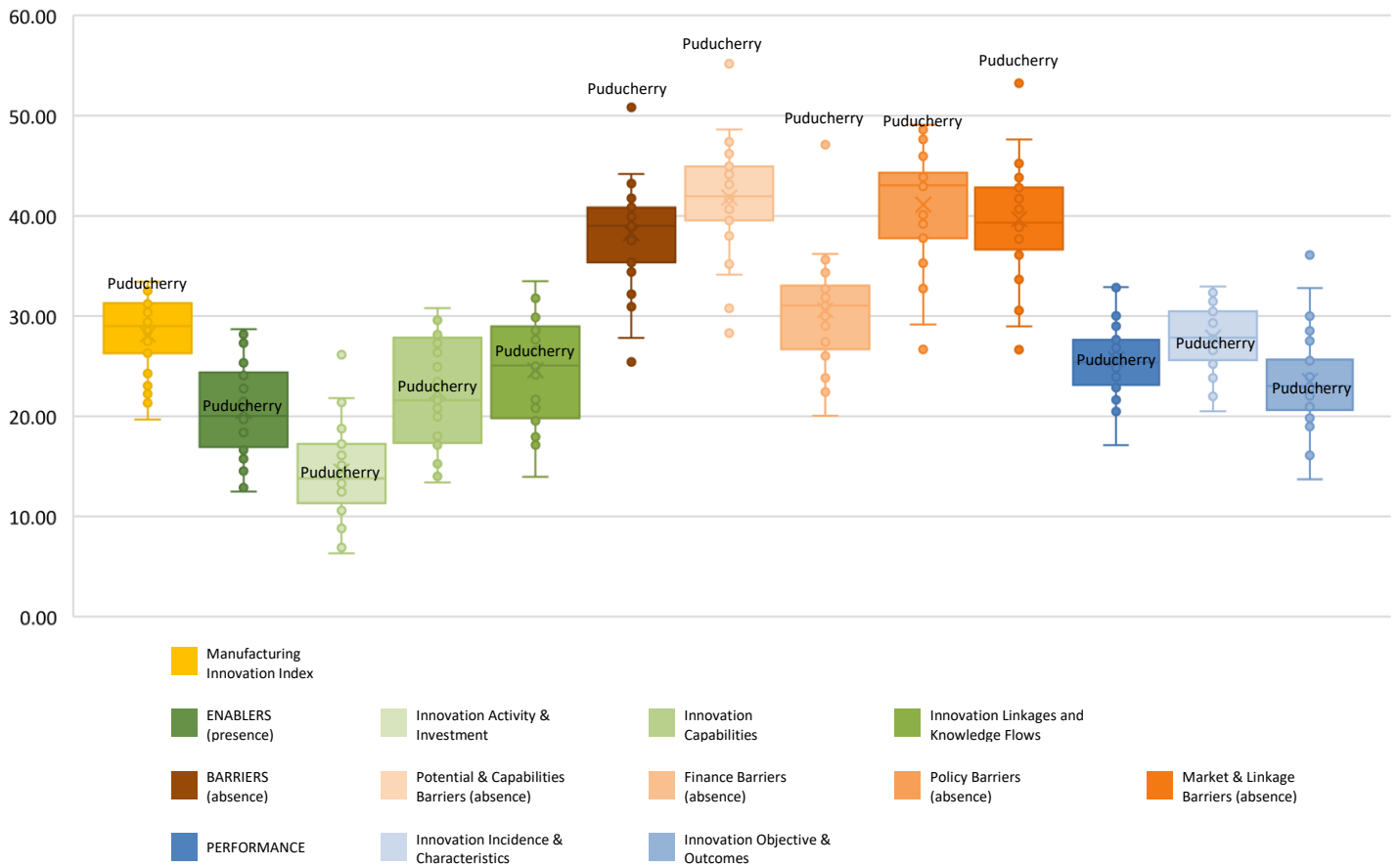
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

31.29

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	19.68	•	16	5

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Barriers (absence)	50.83	•	1	1

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Performance	23.35	•	20	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	12.47	•	20	5
1.1	Firms engaging in tangible innovation input activities	6.98	•	15	4
1.2	Firms engaging in knowledge-based capital (intangible) activities	11.05	•	19	5
1.3	Firms investing in tangible activities	16.86	•	7	3
1.4	Firms investing in knowledge-based capital (intangible) activities	15.70	•	21	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	21.60	•	14	5
2.1	Firms with internal sources of financing	22.09	•	14	5
2.2	Firms with internal funding available for training	23.26	•	15	5
2.3	Firms with R&D Staff	9.88	•	19	5
2.4	Firms using innovative tools and practices among staff that are successful	13.95	•	12	4
2.5	Firms employing/ engaging experts in advanced digital tools in house	20.93	•	16	5
2.6	Firms employing highly qualified personnel, by level of educational attainment	26.74	•	17	5
2.7	Firms highly satisfied with innovation capabilities of employees	49.42	•	15	4
2.8	Firms using advanced, enabling or emerging technologies	6.98	•	12	5
2.9	Firms making use of internal information sources for innovation	6.98	•	17	4
2.10	Firms with an R&D strategy	13.95	•	14	5
2.11	Firms with an I4.0 strategy	4.65	•	10	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	24.97	•	15	4
3.1	Firms highly satisfied with investment climate in the state	58.14	•	8	3
3.2	Firms highly satisfied with ease of doing business in the state	63.37	•	5	3
3.3	Firms highly satisfied with govt. support for enabling innovation	36.63	•	17	5
3.4	Firms highly satisfied with innovation infrastructure in the state	41.28	•	18	5
3.5	Firms highly satisfied with innovation capabilities of external talent pool	37.79	•	10	4
3.6	Firms with formal cooperation agreements	3.49	•	13	5
3.7	Firms with informal cooperation agreements	2.33	•	25	5
3.8	Firms engaging experts in advanced digital tools from external sources	8.72	•	12	5
3.9	Firms selling products in international markets	23.84	•	14	4
3.10	Firms importing from international markets	9.88	•	12	5
3.11	Firms that collaborated with other parties on innovation activities within India	8.72	•	25	5
3.12	Firms that collaborated with other parties on innovation activities from abroad	2.33	•	18	5
3.13	Firms making use of external information sources for innovation	26.74	•	23	5
3.14	Firms with external sources of financing	5.81	•	15	5
3.15	Firms with external funding available for training	1.74	•	18	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	55.17	•	1	1
4.1	Innovation capabilities (R&D, design, etc.) insufficient	51.74	•	1	1
4.2	Organizational rigidities within the firm	55.81	•	1	1
4.3	No need due to prior innovations by this firm	59.88	•	1	1
4.4	Lack of qualified personnel	52.33	•	1	1
4.5	Lack of good ideas for innovations	58.72	•	1	1
4.6	Lack of firm-level infrastructure	53.49	•	1	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	47.09	•	1	1
5.1	Lack of funds within the firm or group	44.19	•	1	1
5.2	Lack of finance from sources outside the firm (credit)	47.67	•	1	1
5.3	Excessive perceived risks	50.00	•	1	1
5.4	Innovation costs too high	46.51	•	1	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	47.83	•	3	2
6.1	Regulations, standards, taxation	53.49	•	1	1

Peer Group Performance

•

6.2	Weakness of intellectual property rights	62.21	•	1	1
6.3	Legislative barriers	28.49	•	21	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	53.23	•	1	1
7.1	Lack of information on markets	57.56	•	1	1
7.2	Deficiencies in the availability of external services	56.40	•	1	1
7.3	Difficulty in finding cooperation partners	58.72	•	1	1
7.4	Lack of information on technology	56.40	•	1	1
7.5	Market dominated by established firms	51.16	•	1	1
7.6	No need due to very little competition in firm's market	61.63	•	1	1
7.7	Uncertain demand for innovative goods or services	45.35	•	1	1
7.8	Low demand for innovations in your market	38.37	•	8	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	25.76	•	20	5
8.1	Firms with new or significantly improved goods	16.86	•	6	1
8.2	Firms with new or significantly improved services	4.65	•	8	4
8.3	Share of new-to-market (NTM) product innovators	25.00	•	26	5
8.4	Firms with at least one type of product innovation developed entirely in-house	93.75	•	20	3
8.5	Firms into innovations in operations and product/process development	10.47	•	17	4
8.6	Firms into innovations in marketing and Sales	6.98	•	10	5
8.7	Firms into innovations in procurement, logistics, and distribution	4.07	•	18	5
8.8	Firms into innovations in administration and management	3.49	•	19	5
8.9	Share of new-to-market (NTM) business process innovators	16.67	•	17	4
8.10	Firms with at least one type of business process innovation developed entirely in-house	86.36	•	6	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	20.94	•	20	5
Objectives					
9.1	Increase the firm's turnover	23.84	•	20	5
9.2	Increase market presence	24.42	•	21	5
9.3	Reduce costs	19.77	•	19	5
9.4	Product/process enhancement in terms of quality and quantity	22.09	•	16	5
9.5	Reduce environmental impacts	16.86	•	20	5
9.6	Improve health and safety of the firm's employees	16.86	•	17	5
9.7	Meet regulatory requirements (e.g., standards, etc.)	13.95	•	23	5
9.8	Catering to Corporate Social Responsibility	13.95	•	22	5
Outcomes					
9.9	Opened up new market opportunities	18.60	•	17	5
9.10	Responded to existing or forthcoming regulatory provisions	12.79	•	14	3
9.11	Responded to market pressures	17.44	•	19	5
9.12	Responded to cost pressures	17.44	•	15	5
9.13	Improved firm's turnover	22.09	•	10	3
9.14	Firms reporting turnover from new-to-market product innovations	34.38	•	20	4
9.15	Firms reporting turnover from NTM business process innovations	22.22	•	16	4
9.16	Turnover of an innovative firm (% of GSDP per capita)	49.81	•	11	1
9.17	Employment in innovative firms (as a percentage of total employment)	40.08	•	16	2
9.18	Firms that were granted IP rights	13.95	•	18	4
9.19	Firms that attained innovation outcomes through I4.0 technologies	5.23	•	11	4

States in the peer group based on similar GSDP per capita

Chandigarh, Ner States, Goa, Himachal Pradesh, Jammu & Kashmir, Uttarakhand

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation

Punjab

IMI
Overall
Rank

17

IMI
Score

27.48

Category

Major States

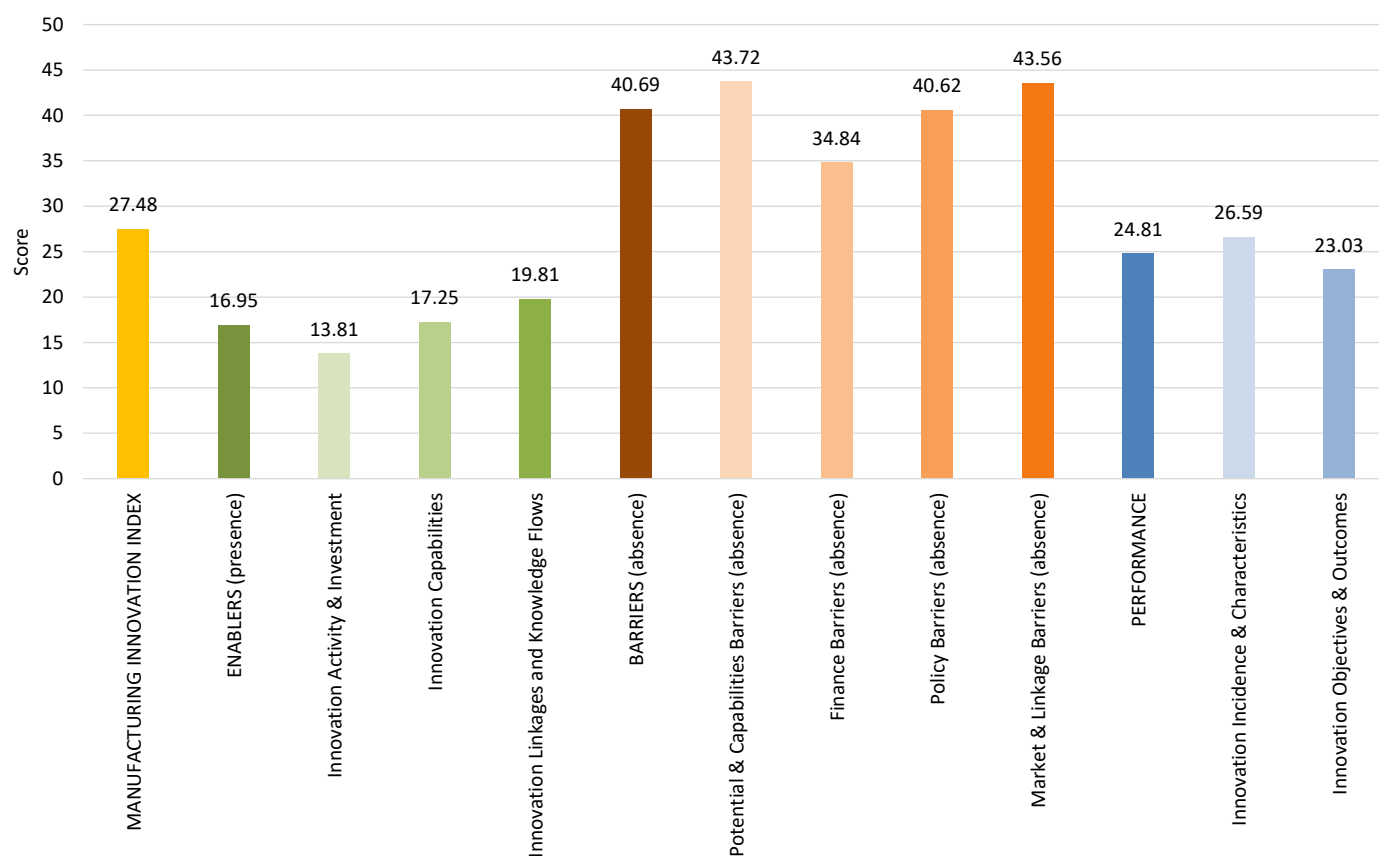
IMI Category Rank

11

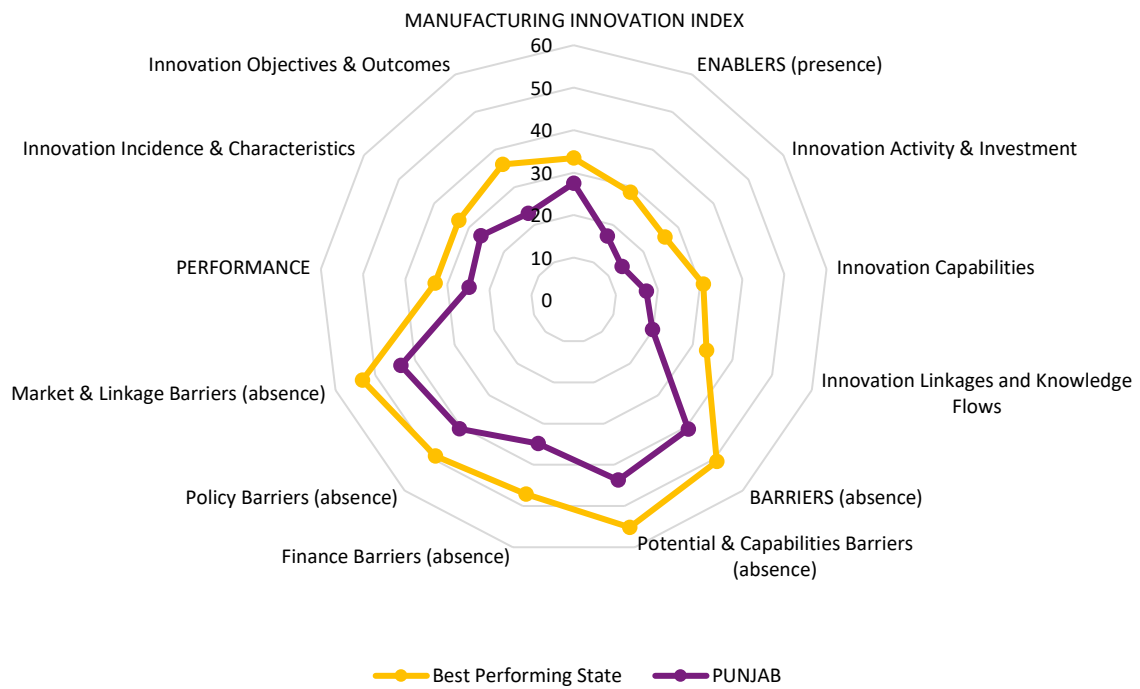
GSDP per capita (INR lakhs)

1.18

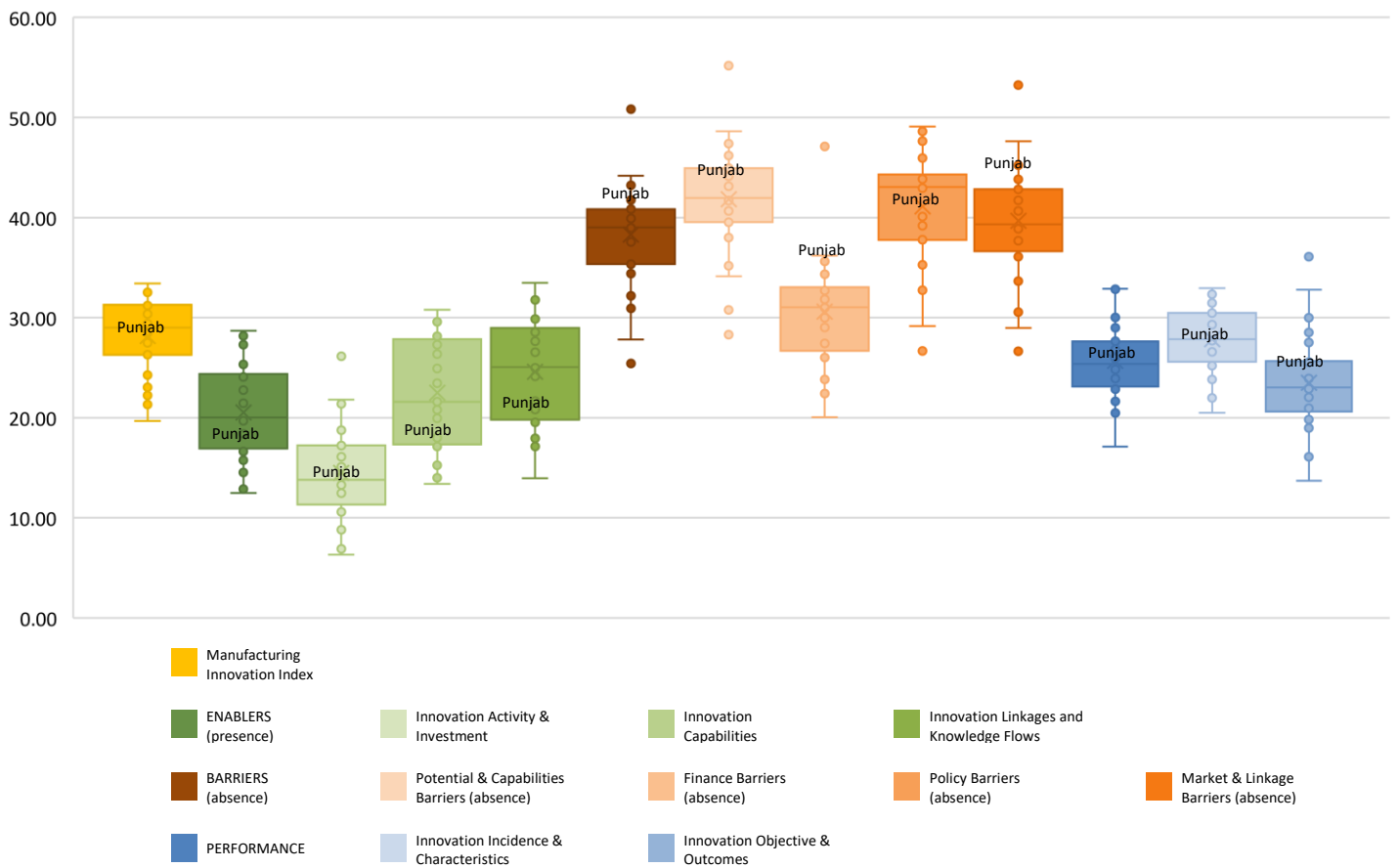
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

27.48

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	16.95	•	20	13

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Barriers (absence)	40.69	•	8	5

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Performance	24.81	•	17	11

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	13.81	•	14	8
1.1	Firms engaging in tangible innovation input activities	5.57	•	24	16
1.2	Firms engaging in knowledge-based capital (intangible) activities	11.15	•	18	12
1.3	Firms investing in tangible activities	12.13	•	18	11
1.4	Firms investing in knowledge-based capital (intangible) activities	24.92	•	9	6

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	17.25	•	22	14
2.1	Firms with internal sources of financing	18.36	•	20	13
2.2	Firms with internal funding available for training	18.03	•	19	12
2.3	Firms with R&D Staff	8.20	•	23	15
2.4	Firms using innovative tools and practices among staff that are successful	7.21	•	24	15
2.5	Firms employing/ engaging experts in advanced digital tools in house	19.02	•	18	11
2.6	Firms employing highly qualified personnel, by level of educational attainment	20.00	•	26	17
2.7	Firms highly satisfied with innovation capabilities of employees	40.66	•	23	16
2.8	Firms using advanced, enabling or emerging technologies	4.59	•	19	12
2.9	Firms making use of internal information sources for innovation	30.82	•	21	13
2.10	Firms with an R&D strategy	11.48	•	19	11
2.11	Firms with an I4.0 strategy	3.28	•	15	8

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	19.81	•	21	14
3.1	Firms highly satisfied with investment climate in the state	41.31	•	22	15
3.2	Firms highly satisfied with ease of doing business in the state	48.85	•	19	12
3.3	Firms highly satisfied with govt. support for enabling innovation	29.51	•	23	16
3.4	Firms highly satisfied with innovation infrastructure in the state	34.75	•	23	16
3.5	Firms highly satisfied with innovation capabilities of external talent pool	24.59	•	23	16
3.6	Firms with formal cooperation agreements	1.31	•	25	17
3.7	Firms with informal cooperation agreements	4.26	•	20	13
3.8	Firms engaging experts in advanced digital tools from external sources	4.59	•	20	13
3.9	Firms selling products in international markets	19.02	•	17	10
3.10	Firms importing from international markets	7.87	•	16	8
3.11	Firms that collaborated with other parties on innovation activities within India	13.77	•	15	10
3.12	Firms that collaborated with other parties on innovation activities from abroad	2.30	•	19	12
3.13	Firms making use of external information sources for innovation	29.18	•	17	13
3.14	Firms with external sources of financing	4.59	•	20	13
3.15	Firms with external funding available for training	0.98	•	23	16

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	43.72	•	10	7
4.1	Innovation capabilities (R&D, design, etc.) insufficient	38.69	•	10	7
4.2	Organizational rigidities within the firm	49.18	•	4	2
4.3	No need due to prior innovations by this firm	46.56	•	12	9
4.4	Lack of qualified personnel	39.67	•	10	7
4.5	Lack of good ideas for innovations	45.90	•	12	8
4.6	Lack of firm-level infrastructure	42.62	•	14	9

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	34.84	•	5	3
5.1	Lack of funds within the firm or group	30.49	•	6	4
5.2	Lack of finance from sources outside the firm (credit)	34.10	•	7	5
5.3	Excessive perceived risks	40.33	•	3	2
5.4	Innovation costs too high	34.10	•	4	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	40.62	•	16	10
6.1	Regulations, standards, taxation	45.25	•	7	4

Peer Group Performance

•

6.2	Weakness of intellectual property rights	48.85	•	13	8
6.3	Legislative barriers	28.20	•	22	14

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	43.56	•	6	3
7.1	Lack of information on markets	46.23	•	5	3
7.2	Deficiencies in the availability of external services	43.93	•	4	2
7.3	Difficulty in finding cooperation partners	47.21	•	3	1
7.4	Lack of information on technology	44.59	•	5	2
7.5	Market dominated by established firms	43.93	•	5	3
7.6	No need due to very little competition in firm's market	49.51	•	13	8
7.7	Uncertain demand for innovative goods or services	38.03	•	12	8
7.8	Low demand for innovations in your market	35.08	•	15	11

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	26.59	•	18	11
8.1	Firms with new or significantly improved goods	12.79	•	17	10
8.2	Firms with new or significantly improved services	2.62	•	17	11
8.3	Share of new-to-market (NTM) product innovators	41.03	•	18	12
8.4	Firms with at least one type of product innovation developed entirely in-house	94.87	•	17	12
8.5	Firms into innovations in operations and product/process development	13.11	•	9	7
8.6	Firms into innovations in marketing and Sales	4.92	•	22	14
8.7	Firms into innovations in procurement, logistics, and distribution	2.95	•	24	16
8.8	Firms into innovations in administration and management	3.28	•	22	14
8.9	Share of new-to-market (NTM) business process innovators	17.50	•	15	10
8.10	Firms with at least one type of business process innovation developed entirely in-house	82.22	•	11	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	23.03	•	14	8
Objectives					
9.1	Increase the firm's turnover	28.85	•	10	7
9.2	Increase market presence	29.18	•	12	8
9.3	Reduce costs	22.95	•	13	8
9.4	Product/process enhancement in terms of quality and quantity	24.26	•	14	9
9.5	Reduce environmental impacts	19.34	•	12	7
9.6	Improve health and safety of the firm's employees	17.05	•	15	9
9.7	Meet regulatory requirements (e.g., standards, etc.)	18.69	•	13	8
9.8	Catering to Corporate Social Responsibility	17.05	•	12	7
Outcomes					
9.9	Opened up new market opportunities	19.34	•	12	8
9.10	Responded to existing or forthcoming regulatory provisions	14.10	•	11	8
9.11	Responded to market pressures	18.36	•	16	10
9.12	Responded to cost pressures	17.70	•	14	9
9.13	Improved firm's turnover	20.66	•	13	8
9.14	Firms reporting turnover from new-to-market product innovations	41.03	•	16	12
9.15	Firms reporting turnover from NTM business process innovations	17.50	•	21	14
9.16	Turnover of an innovative firm (% of GSDP per capita)	35.04	•	18	13
9.17	Employment in innovative firms (as a percentage of total employment)	51.73	•	5	4
9.18	Firms that were granted IP rights	20.66	•	9	5
9.19	Firms that attained innovation outcomes through I4.0 technologies	4.26	•	14	8

States in the peer group based on similar GSDP per capita Odisha, Bihar, Haryana, Kerala, Chhattisgarh, Madhya Pradesh Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation

Rajasthan

IMI
Overall
Rank

20

IMI
Score

26.42

Category

Major States

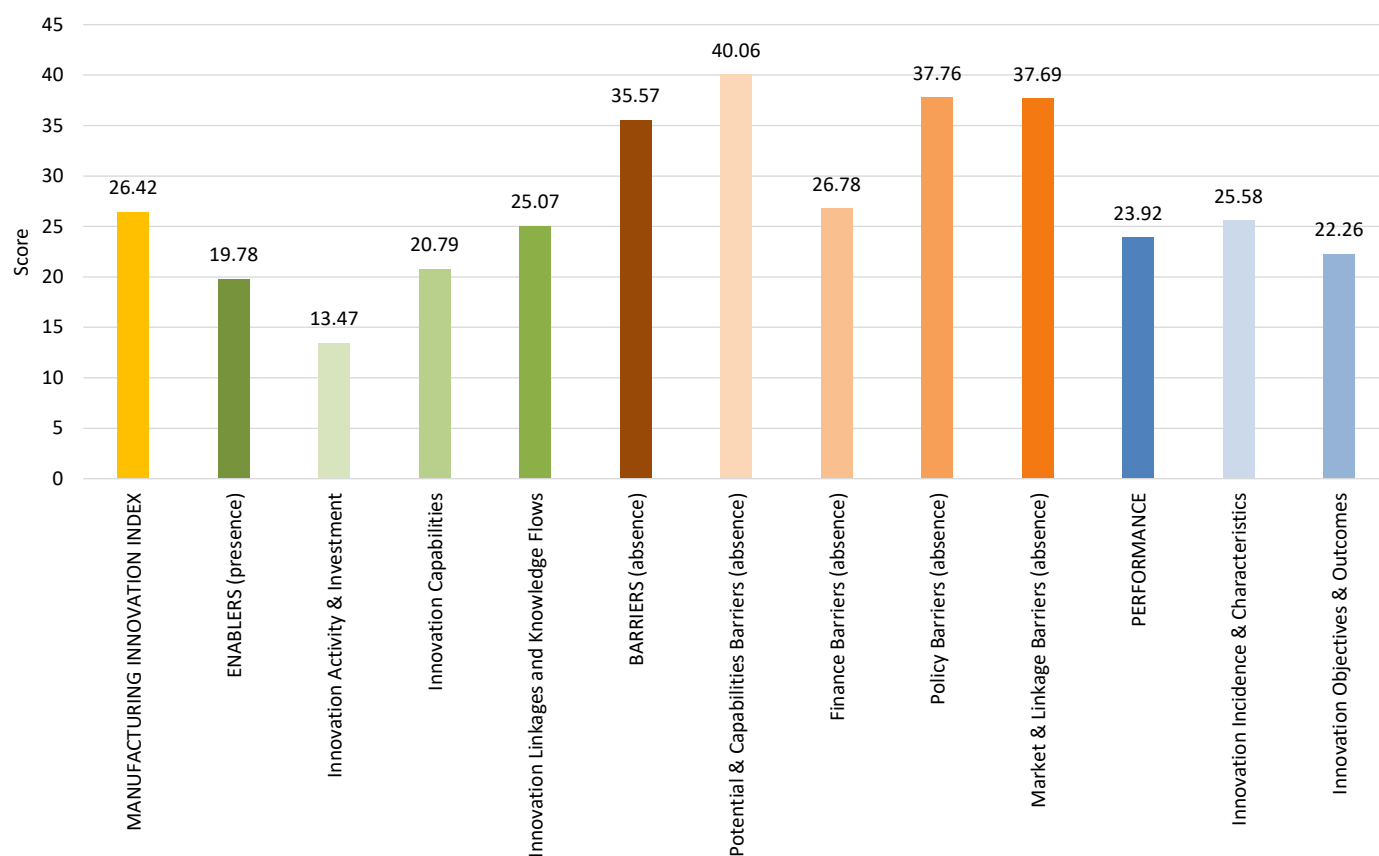
IMI Category Rank

13

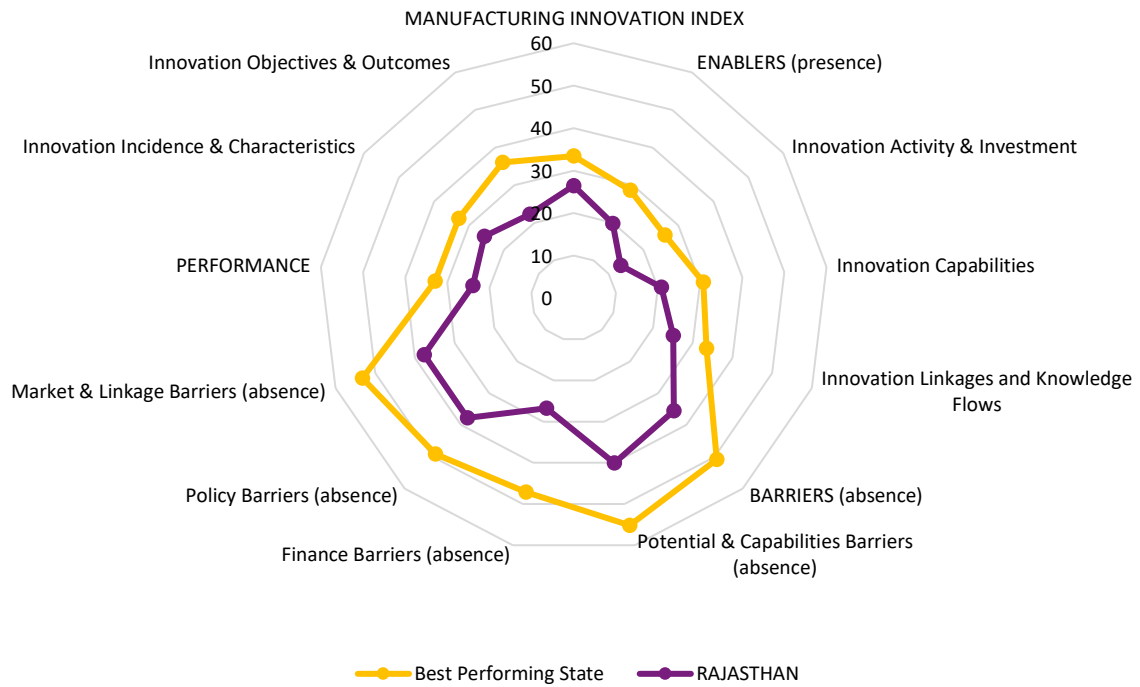
GSDP per capita (INR lakhs)

0.76

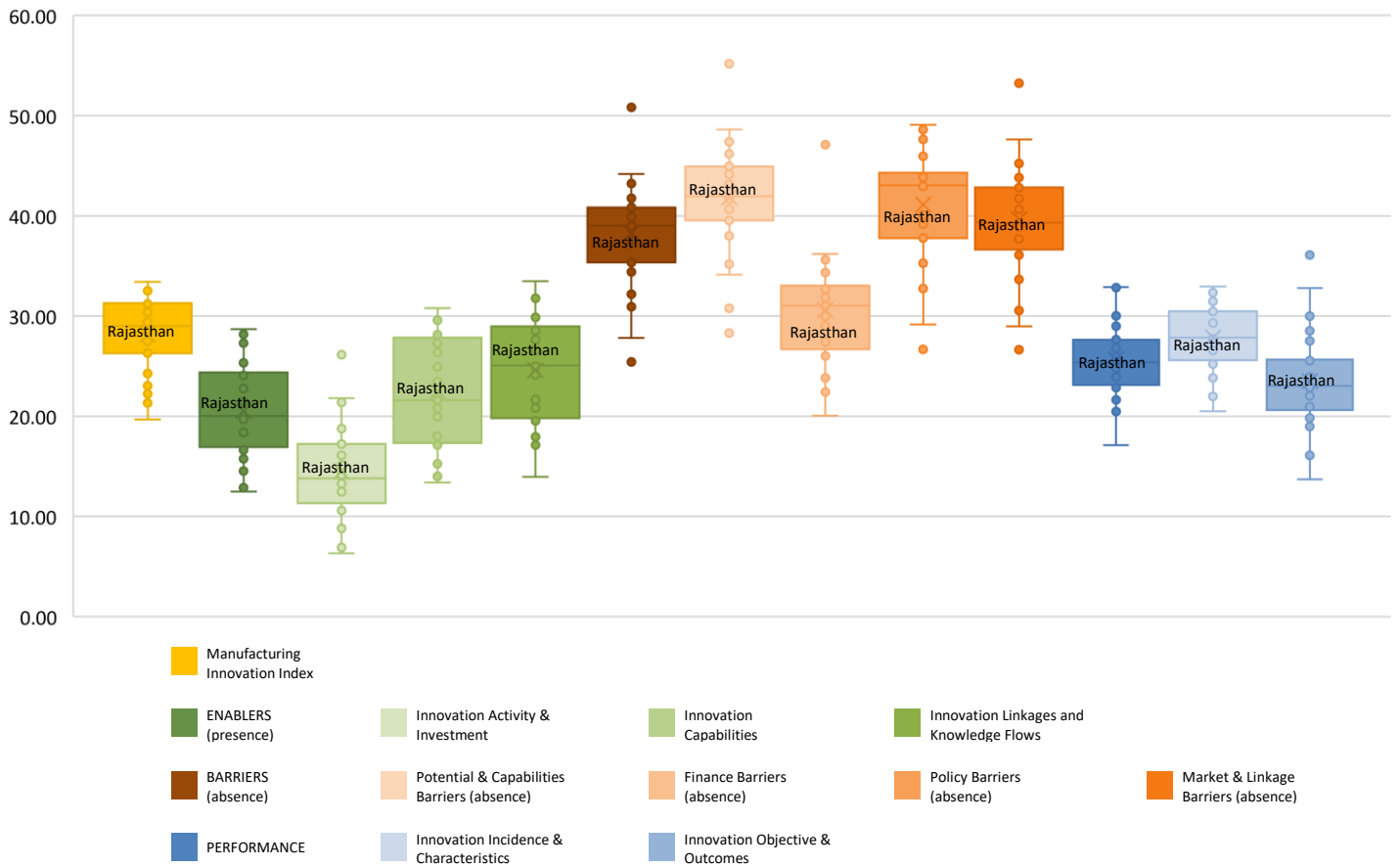
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

26.42

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	19.78	•	15	9

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Barriers (absence)	35.57	•	20	13

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	13.47	•	16	10
1.1	Firms engaging in tangible innovation input activities	8.31	•	11	8
1.2	Firms engaging in knowledge-based capital (intangible) activities	12.73	•	14	8
1.3	Firms investing in tangible activities	10.91	•	21	14
1.4	Firms investing in knowledge-based capital (intangible) activities	20.78	•	14	8

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	20.79	•	16	9
2.1	Firms with internal sources of financing	23.38	•	12	8
2.2	Firms with internal funding available for training	20.52	•	18	11
2.3	Firms with R&D Staff	7.01	•	24	16
2.4	Firms using innovative tools and practices among staff that are successful	13.25	•	13	7
2.5	Firms employing/ engaging experts in advanced digital tools in house	20.78	•	17	10
2.6	Firms employing highly qualified personnel, by level of educational attainment	22.60	•	22	14
2.7	Firms highly satisfied with innovation capabilities of employees	51.43	•	12	8
2.8	Firms using advanced, enabling or emerging technologies	7.27	•	11	7
2.9	Firms making use of internal information sources for innovation	35.58	•	15	10
2.10	Firms with an R&D strategy	12.21	•	17	9
2.11	Firms with an I4.0 strategy	3.38	•	14	7

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	25.07	•	13	8
3.1	Firms highly satisfied with investment climate in the state	54.03	•	13	7
3.2	Firms highly satisfied with ease of doing business in the state	55.58	•	14	8
3.3	Firms highly satisfied with govt. support for enabling innovation	44.42	•	11	7
3.4	Firms highly satisfied with innovation infrastructure in the state	49.35	•	11	7
3.5	Firms highly satisfied with innovation capabilities of external talent pool	32.47	•	14	8
3.6	Firms with formal cooperation agreements	2.08	•	19	12
3.7	Firms with informal cooperation agreements	5.71	•	10	8
3.8	Firms engaging experts in advanced digital tools from external sources	5.45	•	18	11
3.9	Firms selling products in international markets	20.52	•	16	9
3.10	Firms importing from international markets	5.97	•	22	14
3.11	Firms that collaborated with other parties on innovation activities within India	12.99	•	17	12
3.12	Firms that collaborated with other parties on innovation activities from abroad	3.38	•	14	9
3.13	Firms making use of external information sources for innovation	30.39	•	15	11
3.14	Firms with external sources of financing	5.71	•	16	9
3.15	Firms with external funding available for training	2.34	•	14	12

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	40.06	•	20	13
4.1	Innovation capabilities (R&D, design, etc.) insufficient	35.06	•	22	15
4.2	Organizational rigidities within the firm	40.26	•	21	14
4.3	No need due to prior innovations by this firm	44.68	•	18	13
4.4	Lack of qualified personnel	34.81	•	23	15
4.5	Lack of good ideas for innovations	43.64	•	18	12
4.6	Lack of firm-level infrastructure	42.34	•	17	11

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	31.05	•	20	13
5.1	Lack of funds within the firm or group	23.38	•	19	12
5.2	Lack of finance from sources outside the firm (credit)	28.31	•	18	12
5.3	Excessive perceived risks	28.83	•	23	16
5.4	Innovation costs too high	27.01	•	23	16

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	37.76	•	21	14
6.1	Regulations, standards, taxation	36.62	•	23	16

Peer Group Performance

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6.2	Weakness of intellectual property rights	45.45	•	19	12
6.3	Legislative barriers	31.43	•	18	12

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	37.69	•	20	13
7.1	Lack of information on markets	37.14	•	21	14
7.2	Deficiencies in the availability of external services	36.36	•	20	13
7.3	Difficulty in finding cooperation partners	37.66	•	21	14
7.4	Lack of information on technology	36.36	•	21	14
7.5	Market dominated by established firms	37.66	•	15	10
7.6	No need due to very little competition in firm's market	46.75	•	17	11
7.7	Uncertain demand for innovative goods or services	35.58	•	18	13
7.8	Low demand for innovations in your market	35.84	•	13	9

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	25.58	•	22	14
8.1	Firms with new or significantly improved goods	9.35	•	21	13
8.2	Firms with new or significantly improved services	3.12	•	14	9
8.3	Share of new-to-market (NTM) product innovators	42.86	•	16	11
8.4	Firms with at least one type of product innovation developed entirely in-house	97.62	•	11	7
8.5	Firms into innovations in operations and product/process development	12.73	•	10	8
8.6	Firms into innovations in marketing and Sales	6.23	•	15	8
8.7	Firms into innovations in procurement, logistics, and distribution	3.38	•	22	14
8.8	Firms into innovations in administration and management	5.19	•	10	5
8.9	Share of new-to-market (NTM) business process innovators	6.12	•	25	16
8.10	Firms with at least one type of business process innovation developed entirely in-house	78.33	•	20	12

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	22.26	•	18	12
Objectives					
9.1	Increase the firm's turnover	25.97	•	16	11
9.2	Increase market presence	27.79	•	15	10
9.3	Reduce costs	22.34	•	16	11
9.4	Product/process enhancement in terms of quality and quantity	22.86	•	15	10
9.5	Reduce environmental impacts	17.14	•	18	12
9.6	Improve health and safety of the firm's employees	16.88	•	16	10
9.7	Meet regulatory requirements (e.g., standards, etc.)	16.88	•	16	11
9.8	Catering to Corporate Social Responsibility	14.29	•	21	14
Outcomes					
9.9	Opened up new market opportunities	18.70	•	16	10
9.10	Responded to existing or forthcoming regulatory provisions	13.25	•	13	9
9.11	Responded to market pressures	18.70	•	13	7
9.12	Responded to cost pressures	17.92	•	13	8
9.13	Improved firm's turnover	20.26	•	14	9
9.14	Firms reporting turnover from new-to-market product innovations	50.00	•	8	6
9.15	Firms reporting turnover from NTM business process innovations	26.53	•	9	5
9.16	Turnover of an innovative firm (% of GSDP per capita)	38.26	•	14	9
9.17	Employment in innovative firms (as a percentage of total employment)	40.77	•	14	10
9.18	Firms that were granted IP rights	11.95	•	23	14
9.19	Firms that attained innovation outcomes through I4.0 technologies	4.16	•	15	9

States in the peer group based on similar GSDP per capita

Andhra Pradesh, Telangana, New Delhi, West Bengal, Madhya Pradesh, Kerala

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation



Tamil Nadu

IMI
Overall
Rank

4

IMI
Score

32.54

Category

IMI Category Rank

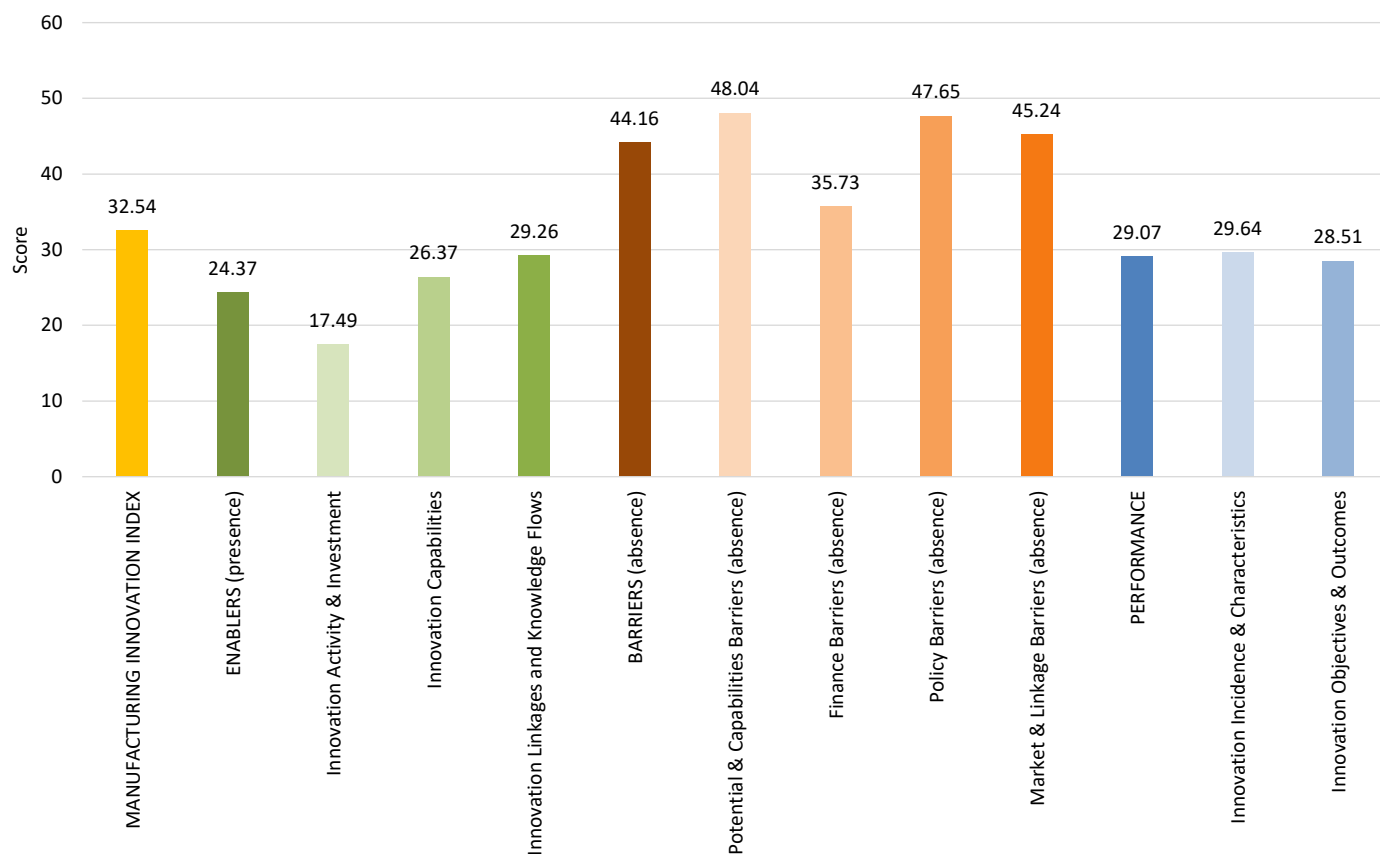
GSDP per capita (INR lakhs)

Major States

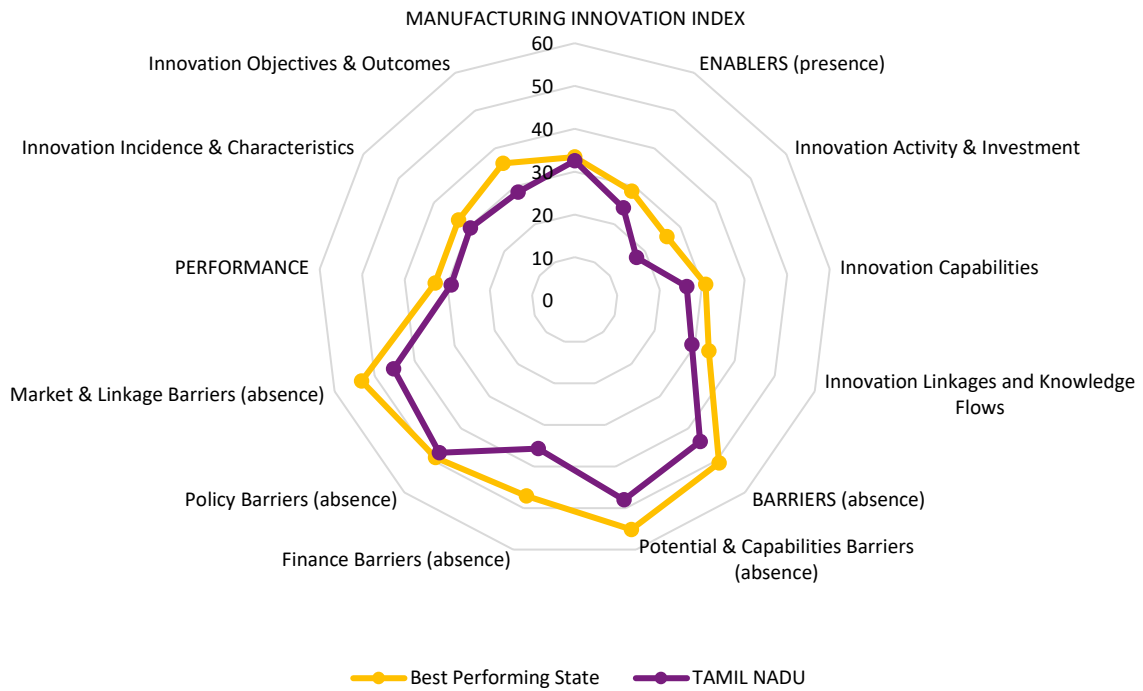
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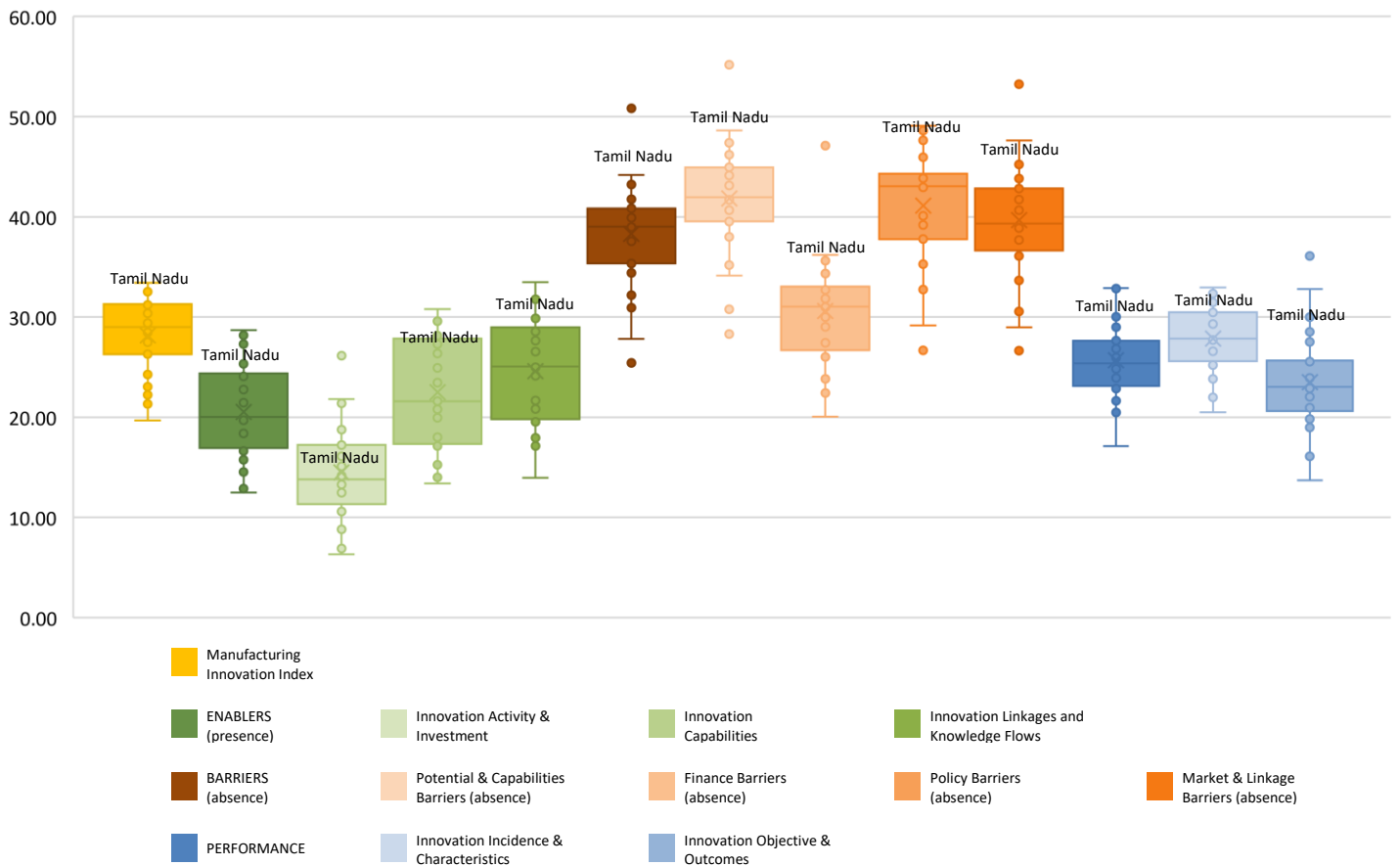
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMI Score

32.54

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	24.37	•	7	5

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Barriers (absence)	44.16	•	2	1

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Performance	29.07	•	5	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	17.49	•	6	4
1.1	Firms engaging in tangible innovation input activities	9.48	•	9	7
1.2	Firms engaging in knowledge-based capital (intangible) activities	14.94	•	9	5
1.3	Firms investing in tangible activities	19.25	•	4	2
1.4	Firms investing in knowledge-based capital (intangible) activities	25.86	•	7	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	26.37	•	9	5
2.1	Firms with internal sources of financing	25.57	•	8	5
2.2	Firms with internal funding available for training	26.72	•	11	5
2.3	Firms with R&D Staff	13.79	•	12	6
2.4	Firms using innovative tools and practices among staff that are successful	17.24	•	8	5
2.5	Firms employing/ engaging experts in advanced digital tools in house	27.01	•	9	5
2.6	Firms employing highly qualified personnel, by level of educational attainment	35.06	•	8	4
2.7	Firms highly satisfied with innovation capabilities of employees	58.62	•	6	5
2.8	Firms using advanced, enabling or emerging technologies	9.20	•	5	3
2.9	Firms making use of internal information sources for innovation	40.23	•	9	6
2.10	Firms with an R&D strategy	16.95	•	11	6
2.11	Firms with an I4.0 strategy	5.75	•	7	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	29.26	•	6	4
3.1	Firms highly satisfied with investment climate in the state	59.48	•	7	5
3.2	Firms highly satisfied with ease of doing business in the state	62.64	•	8	4
3.3	Firms highly satisfied with govt. support for enabling innovation	48.85	•	5	3
3.4	Firms highly satisfied with innovation infrastructure in the state	55.17	•	4	2
3.5	Firms highly satisfied with innovation capabilities of external talent pool	35.34	•	11	5
3.6	Firms with formal cooperation agreements	4.60	•	8	4
3.7	Firms with informal cooperation agreements	4.89	•	16	12
3.8	Firms engaging experts in advanced digital tools from external sources	10.06	•	10	6
3.9	Firms selling products in international markets	37.07	•	1	1
3.10	Firms importing from international markets	17.24	•	1	1
3.11	Firms that collaborated with other parties on innovation activities within India	14.66	•	12	7
3.12	Firms that collaborated with other parties on innovation activities from abroad	5.17	•	10	7
3.13	Firms making use of external information sources for innovation	33.33	•	11	7
3.14	Firms with external sources of financing	6.90	•	10	7
3.15	Firms with external funding available for training	2.30	•	15	13

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	48.04	•	3	1
4.1	Innovation capabilities (R&D, design, etc.) insufficient	42.53	•	4	2
4.2	Organizational rigidities within the firm	49.71	•	3	1
4.3	No need due to prior innovations by this firm	52.30	•	3	1
4.4	Lack of qualified personnel	40.80	•	8	5
4.5	Lack of good ideas for innovations	53.16	•	3	1
4.6	Lack of firm-level infrastructure	50.29	•	2	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	35.73	•	3	2
5.1	Lack of funds within the firm or group	32.47	•	2	1
5.2	Lack of finance from sources outside the firm (credit)	35.92	•	4	2
5.3	Excessive perceived risks	39.37	•	5	3
5.4	Innovation costs too high	35.06	•	2	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	47.65	•	4	1
6.1	Regulations, standards, taxation	45.69	•	6	3

Peer Group Performance

•

6.2	Weakness of intellectual property rights	54.60	•	2	1
6.3	Legislative barriers	42.82	•	5	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	45.24	•	4	2
7.1	Lack of information on markets	43.97	•	7	4
7.2	Deficiencies in the availability of external services	42.24	•	6	4
7.3	Difficulty in finding cooperation partners	47.13	•	5	3
7.4	Lack of information on technology	43.39	•	8	4
7.5	Market dominated by established firms	44.83	•	3	2
7.6	No need due to very little competition in firm's market	54.31	•	3	1
7.7	Uncertain demand for innovative goods or services	42.82	•	4	2
7.8	Low demand for innovations in your market	44.83	•	1	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	29.64	•	9	4
8.1	Firms with new or significantly improved goods	17.24	•	5	4
8.2	Firms with new or significantly improved services	4.02	•	11	6
8.3	Share of new-to-market (NTM) product innovators	50.79	•	8	4
8.4	Firms with at least one type of product innovation developed entirely in-house	95.24	•	16	11
8.5	Firms into innovations in operations and product/process development	17.82	•	3	3
8.6	Firms into innovations in marketing and Sales	6.32	•	14	7
8.7	Firms into innovations in procurement, logistics, and distribution	8.05	•	5	3
8.8	Firms into innovations in administration and management	4.89	•	11	6
8.9	Share of new-to-market (NTM) business process innovators	20.97	•	13	8
8.10	Firms with at least one type of business process innovation developed entirely in-house	78.95	•	18	10

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	28.51	•	4	3
Objectives					
9.1	Increase the firm's turnover	31.90	•	7	5
9.2	Increase market presence	33.33	•	7	5
9.3	Reduce costs	29.89	•	7	5
9.4	Product/process enhancement in terms of quality and quantity	29.89	•	6	5
9.5	Reduce environmental impacts	25.29	•	5	4
9.6	Improve health and safety of the firm's employees	24.14	•	6	4
9.7	Meet regulatory requirements (e.g., standards, etc.)	22.70	•	6	5
9.8	Catering to Corporate Social Responsibility	22.13	•	6	4
Outcomes					
9.9	Opened up new market opportunities	26.44	•	3	3
9.10	Responded to existing or forthcoming regulatory provisions	18.68	•	4	3
9.11	Responded to market pressures	25.29	•	4	3
9.12	Responded to cost pressures	25.57	•	3	3
9.13	Improved firm's turnover	27.87	•	3	3
9.14	Firms reporting turnover from new-to-market product innovations	42.86	•	14	11
9.15	Firms reporting turnover from NTM business process innovations	24.19	•	14	8
9.16	Turnover of an innovative firm (% of GSDP per capita)	54.07	•	9	7
9.17	Employment in innovative firms (as a percentage of total employment)	54.52	•	4	3
9.18	Firms that were granted IP rights	20.98	•	8	4
9.19	Firms that attained innovation outcomes through I4.0 technologies	6.03	•	8	5

States in the peer group based on similar GSDP per capita

Gujarat, Uttar Pradesh, Karnataka, West Bengal, Rajasthan, Andhra Pradesh

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation

Telangana

IMI
Overall
Rank

3

IMI
Score

32.86

Category

IMI Category Rank

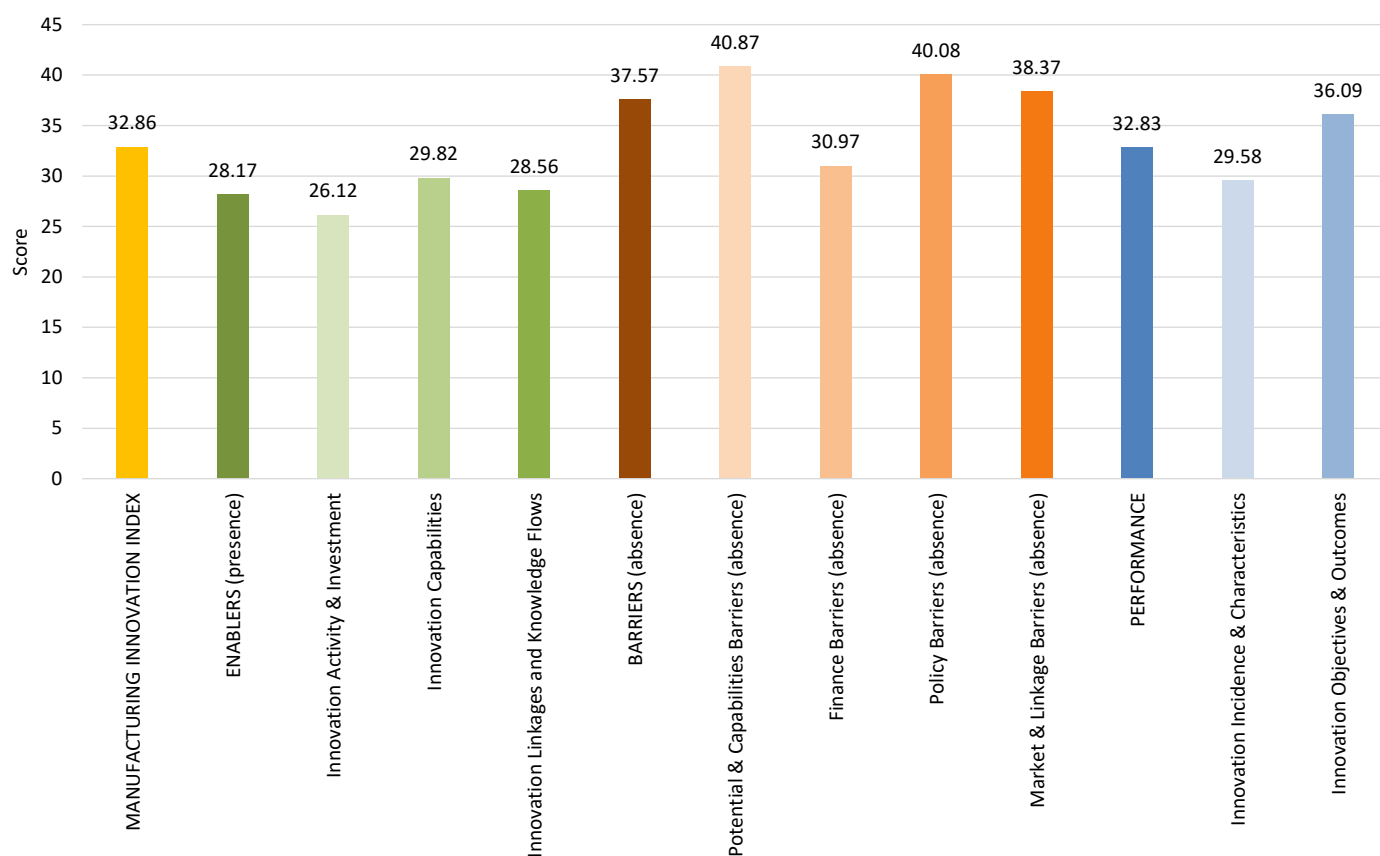
GSDP per capita (INR lakhs)

Major States

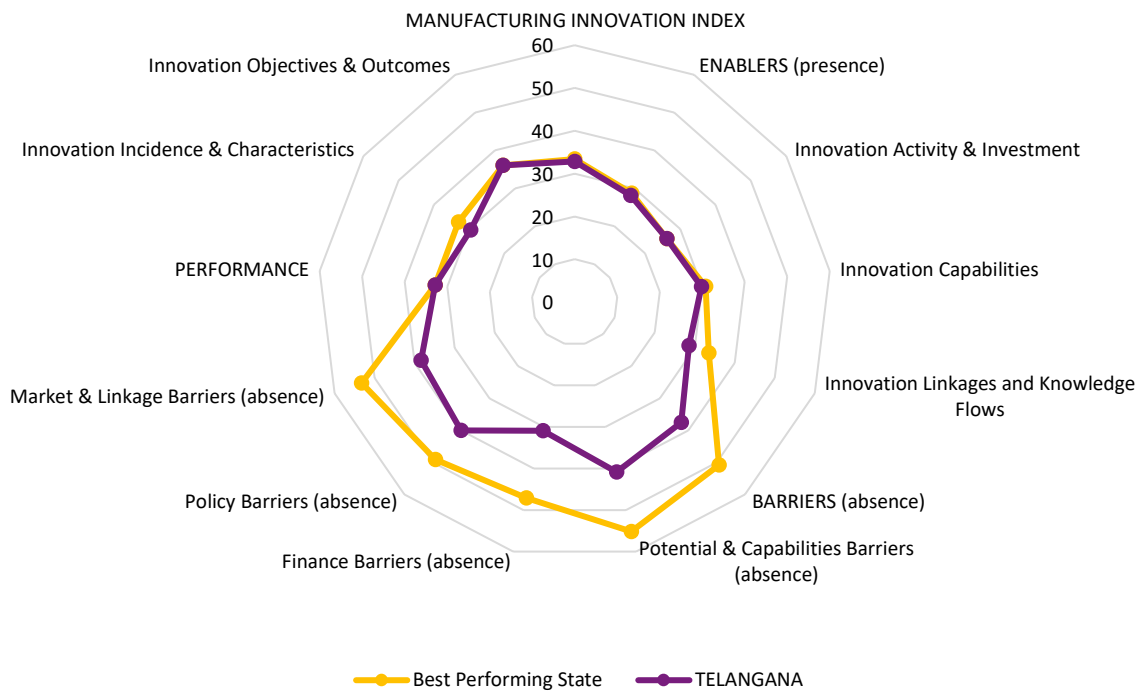
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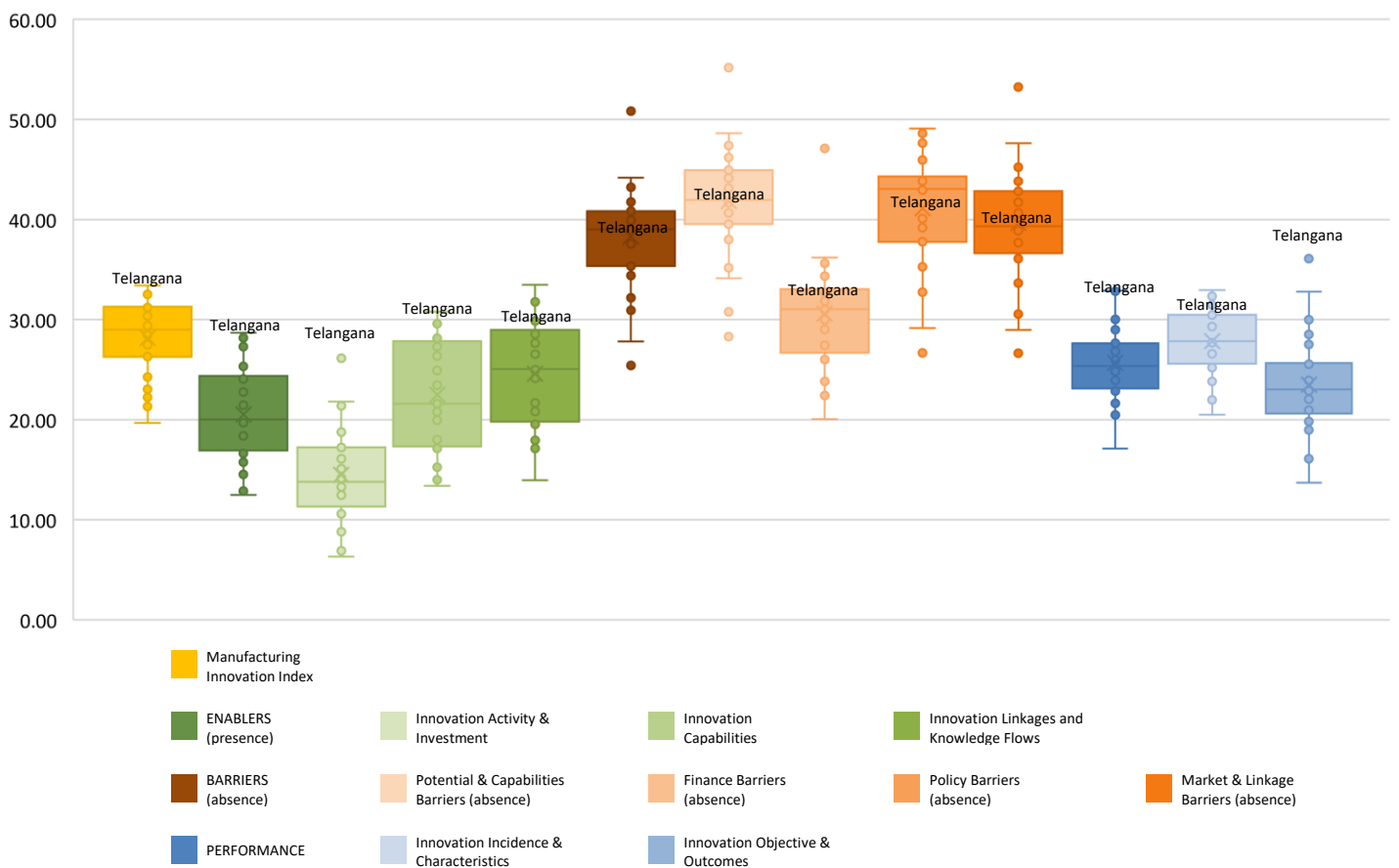
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

32.86

Peer Group Performance

•

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	28.17	•	2	1	Barriers (absence)	37.57	•	19	12	Performance	32.83	•	2	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	26.12	•	1	1
1.1	Firms engaging in tangible innovation input activities	22.95	•	1	1
1.2	Firms engaging in knowledge-based capital (intangible) activities	22.66	•	2	2
1.3	Firms investing in tangible activities	29.18	•	1	1
1.4	Firms investing in knowledge-based capital (intangible) activities	29.75	•	2	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	29.82	•	3	2
2.1	Firms with internal sources of financing	43.06	•	1	1
2.2	Firms with internal funding available for training	33.14	•	2	1
2.3	Firms with R&D Staff	14.16	•	10	4
2.4	Firms using innovative tools and practices among staff that are successful	25.78	•	1	1
2.5	Firms employing/ engaging experts in advanced digital tools in house	24.08	•	13	7
2.6	Firms employing highly qualified personnel, by level of educational attainment	28.05	•	15	9
2.7	Firms highly satisfied with innovation capabilities of employees	59.77	•	5	4
2.8	Firms using advanced, enabling or emerging technologies	13.88	•	1	1
2.9	Firms making use of internal information sources for innovation	46.46	•	5	4
2.10	Firms with an R&D strategy	17.28	•	9	4
2.11	Firms with an I4.0 strategy	5.95	•	6	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	28.56	•	8	5
3.1	Firms highly satisfied with investment climate in the state	55.52	•	12	6
3.2	Firms highly satisfied with ease of doing business in the state	57.51	•	12	6
3.3	Firms highly satisfied with govt. support for enabling innovation	36.54	•	18	11
3.4	Firms highly satisfied with innovation infrastructure in the state	47.59	•	13	9
3.5	Firms highly satisfied with innovation capabilities of external talent pool	40.79	•	3	2
3.6	Firms with formal cooperation agreements	3.97	•	12	6
3.7	Firms with informal cooperation agreements	7.93	•	2	2
3.8	Firms engaging experts in advanced digital tools from external sources	11.90	•	4	2
3.9	Firms selling products in international markets	30.03	•	4	4
3.10	Firms importing from international markets	15.86	•	2	2
3.11	Firms that collaborated with other parties on innovation activities within India	16.71	•	8	5
3.12	Firms that collaborated with other parties on innovation activities from abroad	5.67	•	7	4
3.13	Firms making use of external information sources for innovation	50.42	•	1	1
3.14	Firms with external sources of financing	15.86	•	1	1
3.15	Firms with external funding available for training	4.25	•	2	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	40.87	•	18	12
4.1	Innovation capabilities (R&D, design, etc.) insufficient	37.68	•	15	9
4.2	Organizational rigidities within the firm	44.76	•	14	9
4.3	No need due to prior innovations by this firm	48.16	•	9	7
4.4	Lack of qualified personnel	36.54	•	16	10
4.5	Lack of good ideas for innovations	42.78	•	20	13
4.6	Lack of firm-level infrastructure	35.98	•	25	17

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	30.97	•	15	10
5.1	Lack of funds within the firm or group	28.33	•	10	7
5.2	Lack of finance from sources outside the firm (credit)	29.75	•	15	9
5.3	Excessive perceived risks	33.71	•	16	10
5.4	Innovation costs too high	32.01	•	11	7

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	40.08	•	18	11
6.1	Regulations, standards, taxation	39.66	•	19	12

6.2	Weakness of intellectual property rights	45.33	•	20	13
6.3	Legislative barriers	35.41	•	12	8

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	38.37	•	18	11
7.1	Lack of information on markets	37.68	•	20	13
7.2	Deficiencies in the availability of external services	38.81	•	16	10
7.3	Difficulty in finding cooperation partners	40.51	•	17	10
7.4	Lack of information on technology	36.54	•	19	12
7.5	Market dominated by established firms	32.86	•	24	16
7.6	No need due to very little competition in firm's market	46.74	•	18	12
7.7	Uncertain demand for innovative goods or services	35.98	•	14	9
7.8	Low demand for innovations in your market	38.24	•	9	5

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	29.58	•	11	6
8.1	Firms with new or significantly improved goods	20.11	•	3	2
8.2	Firms with new or significantly improved services	5.95	•	5	3
8.3	Share of new-to-market (NTM) product innovators	35.53	•	19	13
8.4	Firms with at least one type of product innovation developed entirely in-house	93.42	•	21	15
8.5	Firms into innovations in operations and product/process development	25.50	•	1	1
8.6	Firms into innovations in marketing and Sales	15.86	•	1	1
8.7	Firms into innovations in procurement, logistics, and distribution	8.22	•	3	2
8.8	Firms into innovations in administration and management	10.76	•	1	1
8.9	Share of new-to-market (NTM) business process innovators	12.22	•	22	14
8.10	Firms with at least one type of business process innovation developed entirely in-house	77.17	•	22	14

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	36.09	•	1	1
Objectives					
9.1	Increase the firm's turnover	49.58	•	1	1
9.2	Increase market presence	51.27	•	1	1
9.3	Reduce costs	39.94	•	1	1
9.4	Product/process enhancement in terms of quality and quantity	45.61	•	1	1
9.5	Reduce environmental impacts	35.98	•	1	1
9.6	Improve health and safety of the firm's employees	36.83	•	1	1
9.7	Meet regulatory requirements (e.g., standards, etc.)	36.26	•	1	1
9.8	Catering to Corporate Social Responsibility	30.31	•	1	1
Outcomes					
9.9	Opened up new market opportunities	36.26	•	1	1
9.10	Responded to existing or forthcoming regulatory provisions	22.10	•	2	2
9.11	Responded to market pressures	33.71	•	1	1
9.12	Responded to cost pressures	29.75	•	1	1
9.13	Improved firm's turnover	37.39	•	1	1
9.14	Firms reporting turnover from new-to-market product innovations	38.16	•	18	13
9.15	Firms reporting turnover from NTM business process innovations	14.44	•	22	15
9.16	Turnover of an innovative firm (% of GSDP per capita)	28.30	•	22	16
9.17	Employment in innovative firms (as a percentage of total employment)	77.16	•	1	1
9.18	Firms that were granted IP rights	16.43	•	16	11
9.19	Firms that attained innovation outcomes through I4.0 technologies	7.65	•	4	2

States in the peer group based on similar GSDP per capita

Andhra Pradesh, New Delhi, Rajasthan, Madhya Pradesh, Kerala, Haryana

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation

Uttar Pradesh

IMI
Overall
Rank

14

IMI
Score

29.00

Category

Major States

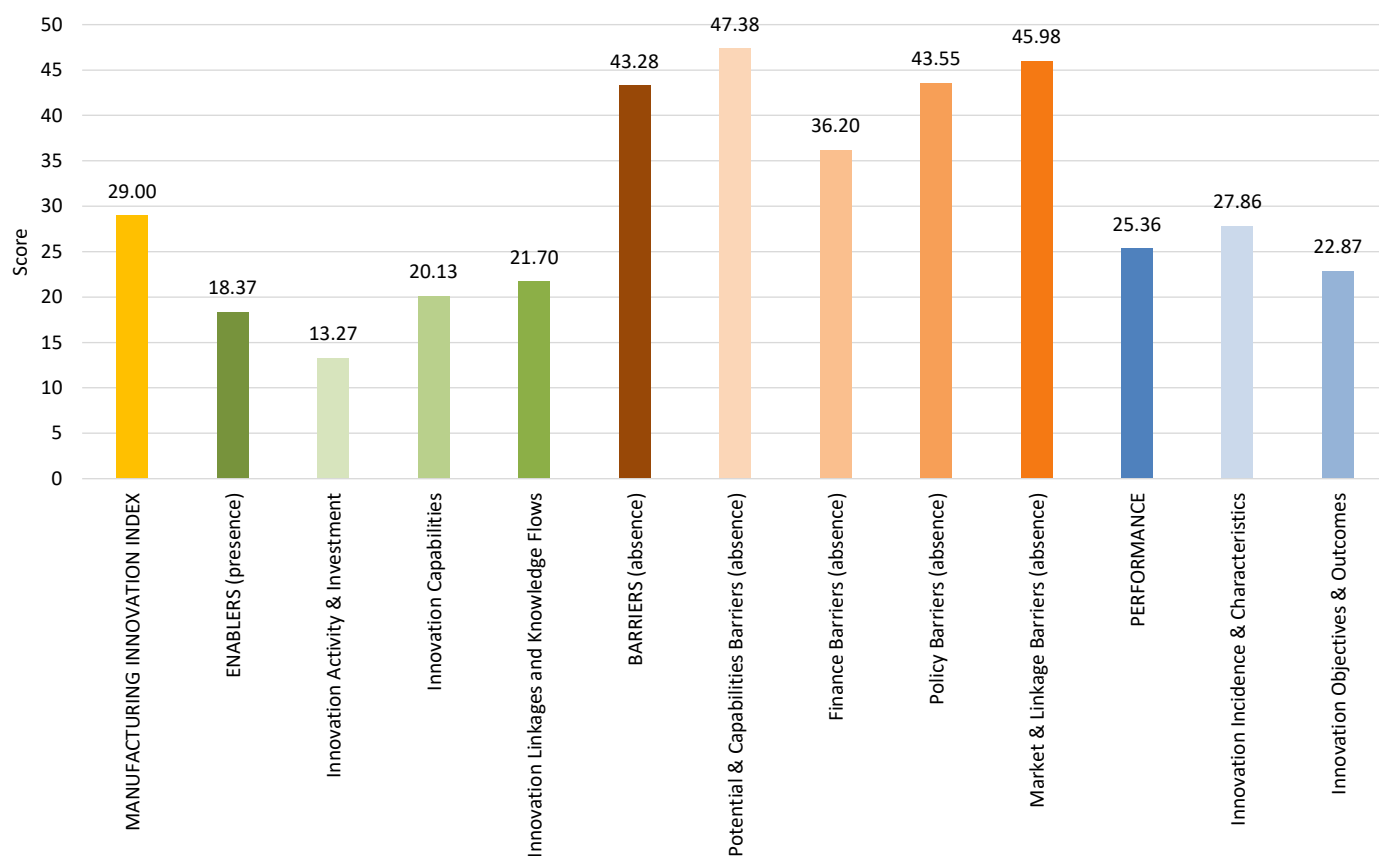
IMI Category Rank

8

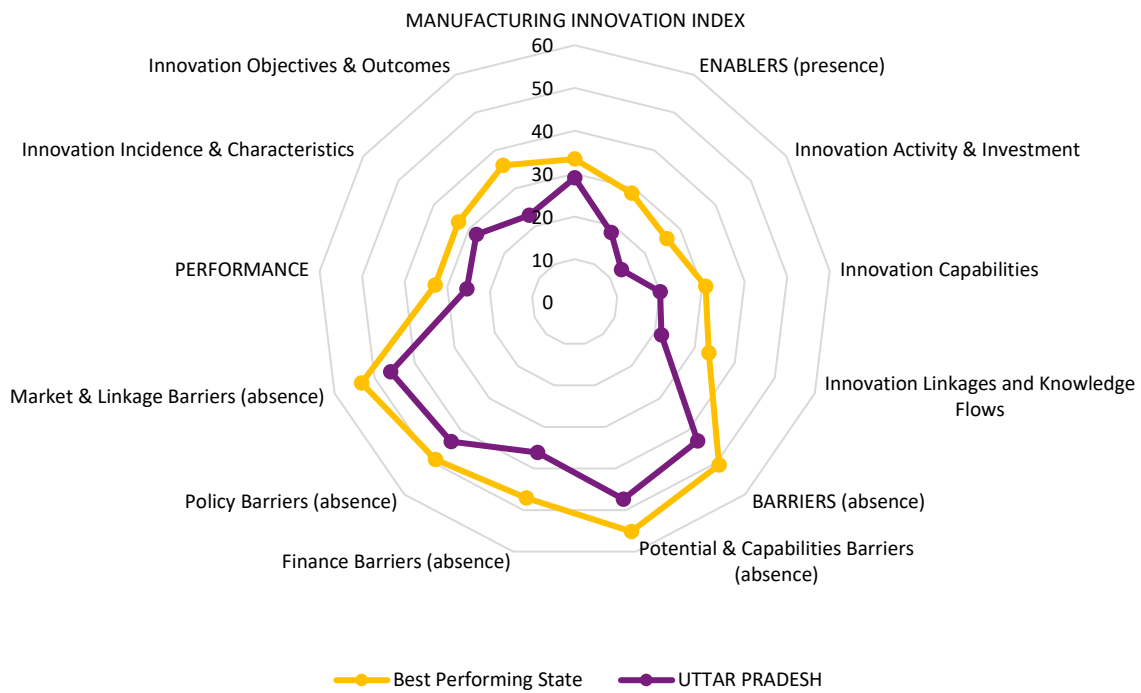
GSDP per capita (INR lakhs)

0.43

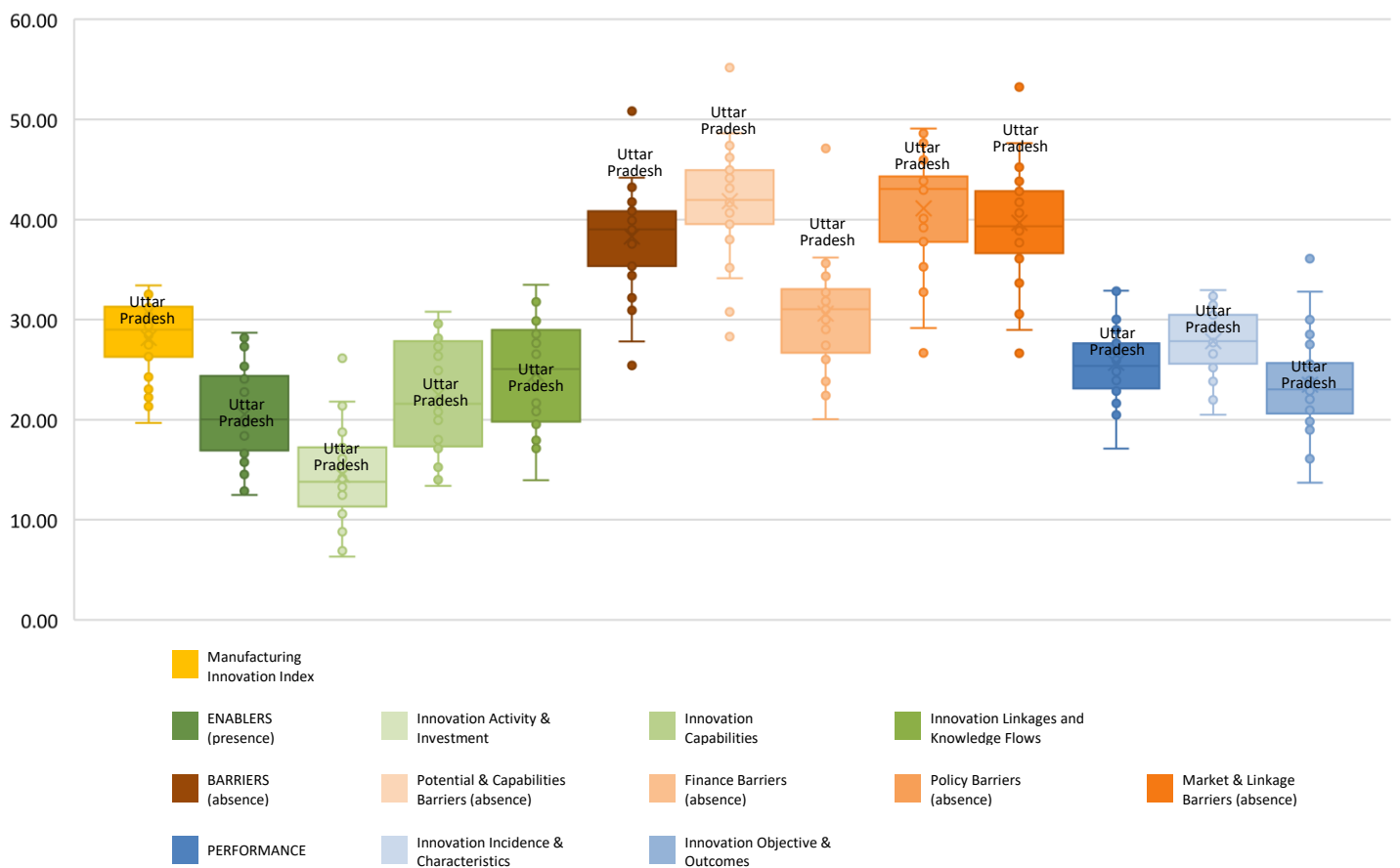
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

29.00

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	18.37	•	18	11

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Barriers (absence)	43.28	•	3	2

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Performance	25.36	•	14	8

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	13.27	•	17	11
1.1	Firms engaging in tangible innovation input activities	7.34	•	14	9
1.2	Firms engaging in knowledge-based capital (intangible) activities	12.15	•	16	10
1.3	Firms investing in tangible activities	13.28	•	16	10
1.4	Firms investing in knowledge-based capital (intangible) activities	19.77	•	17	11

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	20.13	•	17	10
2.1	Firms with internal sources of financing	18.36	•	19	12
2.2	Firms with internal funding available for training	21.75	•	17	10
2.3	Firms with R&D Staff	12.71	•	14	8
2.4	Firms using innovative tools and practices among staff that are successful	9.60	•	20	12
2.5	Firms employing/ engaging experts in advanced digital tools in house	22.03	•	15	9
2.6	Firms employing highly qualified personnel, by level of educational attainment	27.12	•	16	10
2.7	Firms highly satisfied with innovation capabilities of employees	43.22	•	19	12
2.8	Firms using advanced, enabling or emerging technologies	5.65	•	16	9
2.9	Firms making use of internal information sources for innovation	35.03	•	16	11
2.10	Firms with an R&D strategy	12.99	•	15	7
2.11	Firms with an I4.0 strategy	3.11	•	18	10

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	21.70	•	18	11
3.1	Firms highly satisfied with investment climate in the state	45.20	•	19	12
3.2	Firms highly satisfied with ease of doing business in the state	47.74	•	20	13
3.3	Firms highly satisfied with govt. support for enabling innovation	36.16	•	19	12
3.4	Firms highly satisfied with innovation infrastructure in the state	40.96	•	19	12
3.5	Firms highly satisfied with innovation capabilities of external talent pool	24.01	•	24	17
3.6	Firms with formal cooperation agreements	2.26	•	18	11
3.7	Firms with informal cooperation agreements	3.67	•	23	15
3.8	Firms engaging experts in advanced digital tools from external sources	5.08	•	19	12
3.9	Firms selling products in international markets	30.23	•	3	3
3.10	Firms importing from international markets	8.47	•	14	7
3.11	Firms that collaborated with other parties on innovation activities within India	9.32	•	23	16
3.12	Firms that collaborated with other parties on innovation activities from abroad	3.67	•	13	8
3.13	Firms making use of external information sources for innovation	29.66	•	16	12
3.14	Firms with external sources of financing	6.21	•	14	8
3.15	Firms with external funding available for training	1.98	•	16	14

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	47.38	•	4	2
4.1	Innovation capabilities (R&D, design, etc.) insufficient	45.48	•	2	1
4.2	Organizational rigidities within the firm	47.46	•	6	4
4.3	No need due to prior innovations by this firm	21.98	•	4	2
4.4	Lack of qualified personnel	44.63	•	2	1
4.5	Lack of good ideas for innovations	49.15	•	6	4
4.6	Lack of firm-level infrastructure	46.05	•	7	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	36.20	•	2	1
5.1	Lack of funds within the firm or group	30.51	•	5	3
5.2	Lack of finance from sources outside the firm (credit)	37.01	•	2	1
5.3	Excessive perceived risks	42.66	•	2	1
5.4	Innovation costs too high	34.46	•	3	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	43.55	•	13	7
6.1	Regulations, standards, taxation	46.33	•	4	1

Peer Group Performance

•

6.2	Weakness of intellectual property rights	53.39	•	4	2
6.3	Legislative barriers	31.36	•	19	13

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	45.98	•	3	1
7.1	Lack of information on markets	46.33	•	3	1
7.2	Deficiencies in the availability of external services	46.33	•	3	1
7.3	Difficulty in finding cooperation partners	47.18	•	4	2
7.4	Lack of information on technology	45.48	•	4	1
7.5	Market dominated by established firms	46.33	•	2	1
7.6	No need due to very little competition in firm's market	52.54	•	4	2
7.7	Uncertain demand for innovative goods or services	43.79	•	3	1
7.8	Low demand for innovations in your market	41.24	•	4	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	27.86	•	14	9
8.1	Firms with new or significantly improved goods	13.56	•	15	9
8.2	Firms with new or significantly improved services	3.39	•	13	8
8.3	Share of new-to-market (NTM) product innovators	42.86	•	15	10
8.4	Firms with at least one type of product innovation developed entirely in-house	97.96	•	10	6
8.5	Firms into innovations in operations and product/process development	11.30	•	15	10
8.6	Firms into innovations in marketing and Sales	6.21	•	16	9
8.7	Firms into innovations in procurement, logistics, and distribution	4.52	•	16	10
8.8	Firms into innovations in administration and management	3.39	•	20	12
8.9	Share of new-to-market (NTM) business process innovators	17.50	•	16	11
8.10	Firms with at least one type of business process innovation developed entirely in-house	88.46	•	5	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	22.87	•	16	10
Objectives					
9.1	Increase the firm's turnover	24.58	•	19	14
9.2	Increase market presence	25.99	•	19	14
9.3	Reduce costs	18.93	•	20	12
9.4	Product/process enhancement in terms of quality and quantity	20.06	•	19	13
9.5	Reduce environmental impacts	16.38	•	21	14
9.6	Improve health and safety of the firm's employees	15.54	•	22	14
9.7	Meet regulatory requirements (e.g., standards, etc.)	16.67	•	17	12
9.8	Catering to Corporate Social Responsibility	13.84	•	23	15
Outcomes					
9.9	Opened up new market opportunities	19.21	•	13	9
9.10	Responded to existing or forthcoming regulatory provisions	11.02	•	19	12
9.11	Responded to market pressures	18.08	•	18	12
9.12	Responded to cost pressures	16.38	•	17	10
9.13	Improved firm's turnover	19.49	•	15	10
9.14	Firms reporting turnover from new-to-market product innovations	44.90	•	11	9
9.15	Firms reporting turnover from NTM business process innovations	22.50	•	15	9
9.16	Turnover of an innovative firm (% of GSDP per capita)	100.00	•	1	1
9.17	Employment in innovative firms (as a percentage of total employment)	40.23	•	15	11
9.18	Firms that were granted IP rights	15.25	•	17	12
9.19	Firms that attained innovation outcomes through I4.0 technologies	3.11	•	18	10

States in the peer group based on similar GSDP per capita
Karnataka, Gujarat, Tamil Nadu, West Bengal, Rajasthan, Andhra Pradesh
Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation

Uttarakhand

IMI
Overall
Rank

5

IMI
Score

31.72

Category

Hill States

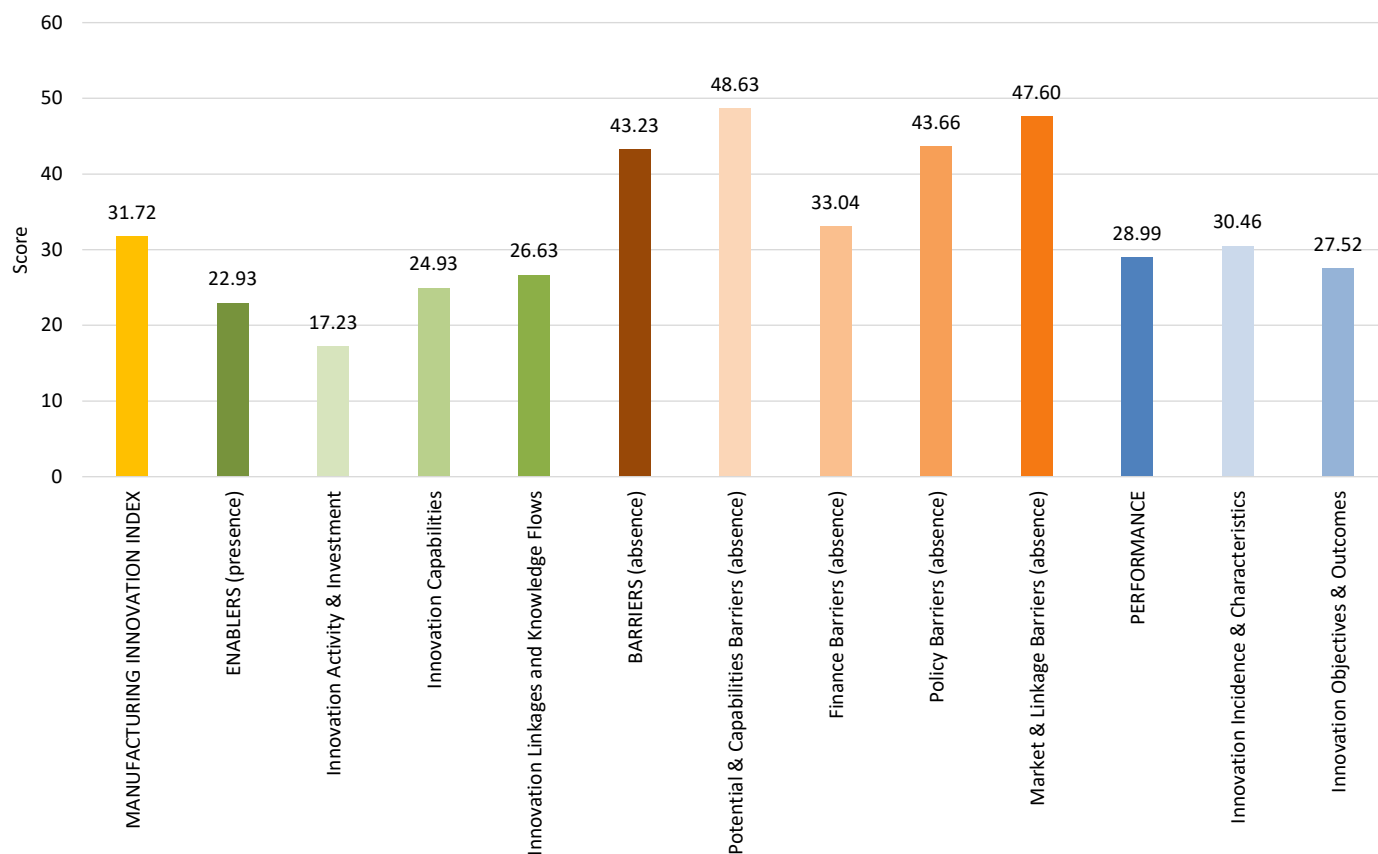
IMI Category Rank

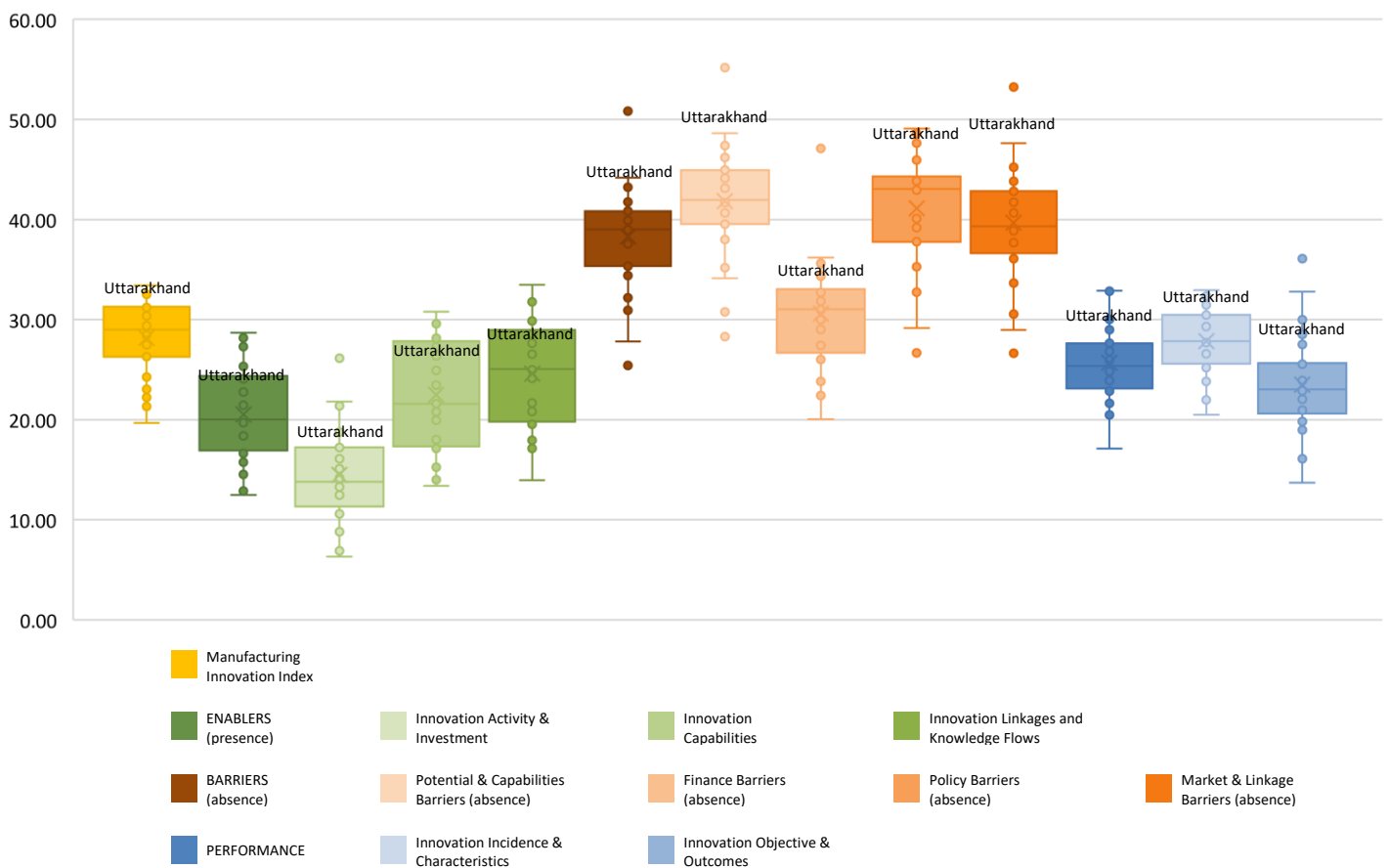
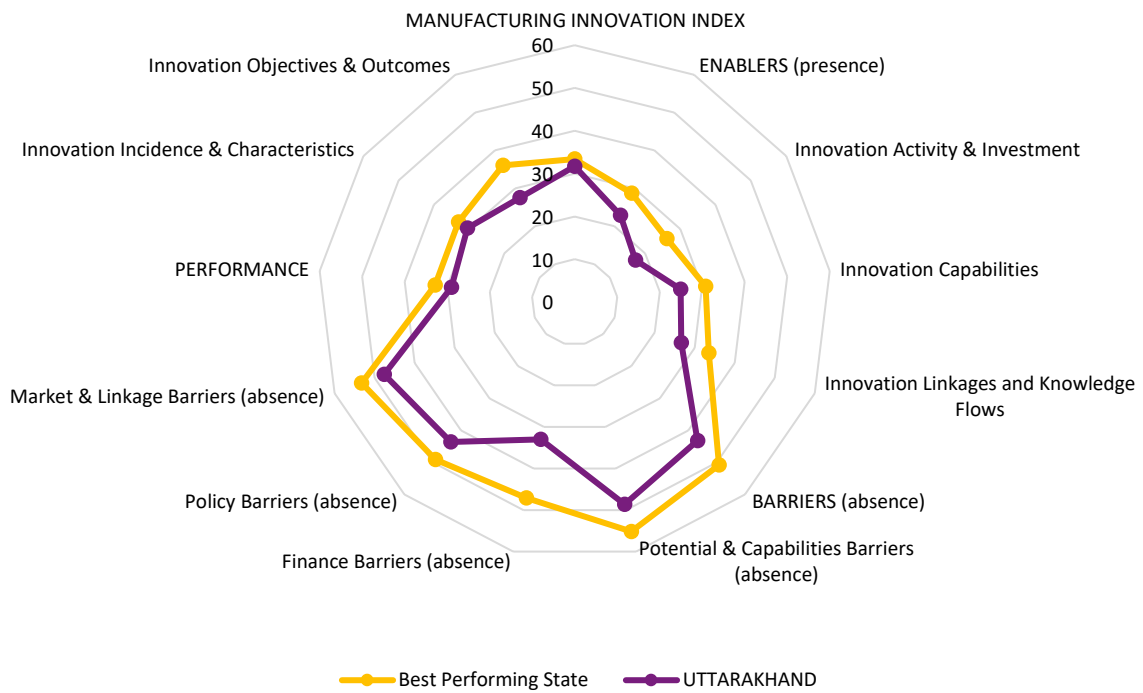
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GSDP per capita (INR lakhs)

1.48

MANUFACTURING INNOVATION SCORES





IMII Score

31.72

Peer Group Performance

•

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank	Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	22.93	•	9	1	Barriers (absence)	43.23	•	5	2	Performance	28.99	•	6	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
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Pillar 1	Innovation Activity & Investment	17.23	•	7	1
1.1	Firms engaging in tangible innovation input activities	7.51	•	13	2
1.2	Firms engaging in knowledge-based capital (intangible) activities	15.96	•	7	1
1.3	Firms investing in tangible activities	20.19	•	3	1
1.4	Firms investing in knowledge-based capital (intangible) activities	25.35	•	8	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
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Pillar 2	Innovation Capabilities	24.93	•	12	2
2.1	Firms with internal sources of financing	26.76	•	5	1
2.2	Firms with internal funding available for training	31.92	•	4	1
2.3	Firms with R&D Staff	19.72	•	2	1
2.4	Firms using innovative tools and practices among staff that are successful	17.37	•	6	1
2.5	Firms employing/ engaging experts in advanced digital tools in house	24.88	•	12	2
2.6	Firms employing highly qualified personnel, by level of educational attainment	29.58	•	12	2
2.7	Firms highly satisfied with innovation capabilities of employees	49.30	•	16	2
2.8	Firms using advanced, enabling or emerging technologies	6.57	•	15	2
2.9	Firms making use of internal information sources for innovation	33.80	•	18	3
2.10	Firms with an R&D strategy	20.19	•	6	2
2.11	Firms with an I4.0 strategy	3.76	•	12	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
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Pillar 3	Innovation Linkages and Knowledge Flows	26.63	•	11	2
3.1	Firms highly satisfied with investment climate in the state	56.34	•	10	2
3.2	Firms highly satisfied with ease of doing business in the state	59.15	•	11	2
3.3	Firms highly satisfied with govt. support for enabling innovation	43.66	•	12	2
3.4	Firms highly satisfied with innovation infrastructure in the state	46.01	•	14	2
3.5	Firms highly satisfied with innovation capabilities of external talent pool	38.03	•	9	2
3.6	Firms with formal cooperation agreements	4.69	•	7	1
3.7	Firms with informal cooperation agreements	5.63	•	12	1
3.8	Firms engaging experts in advanced digital tools from external sources	10.33	•	9	1
3.9	Firms selling products in international markets	23.94	•	13	2
3.10	Firms importing from international markets	13.62	•	5	1
3.11	Firms that collaborated with other parties on innovation activities within India	12.68	•	18	2
3.12	Firms that collaborated with other parties on innovation activities from abroad	4.23	•	11	2
3.13	Firms making use of external information sources for innovation	33.80	•	10	1
3.14	Firms with external sources of financing	6.57	•	12	2
3.15	Firms with external funding available for training	1.41	•	21	4

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
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Pillar 4	Potential & Capabilities Barriers Pillar Score	48.63	•	2	1
4.1	Innovation capabilities (R&D, design, etc.) insufficient	44.13	•	3	1
4.2	Organizational rigidities within the firm	51.64	•	2	1
4.3	No need due to prior innovations by this firm	53.05	•	2	1
4.4	Lack of qualified personnel	44.60	•	3	1
4.5	Lack of good ideas for innovations	53.52	•	2	1
4.6	Lack of firm-level infrastructure	46.01	•	8	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
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Pillar 5	Finance Barriers Pillar Score	33.04	•	7	2
5.1	Lack of funds within the firm or group	27.70	•	13	3
5.2	Lack of finance from sources outside the firm (credit)	31.92	•	11	2
5.3	Excessive perceived risks	38.97	•	6	2
5.4	Innovation costs too high	33.33	•	6	2

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
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Pillar 6	Policy Barriers Pillar Score	43.66	•	10	2
6.1	Regulations, standards, taxation	46.95	•	3	2

6.2	Weakness of intellectual property rights	53.99	•	3	1
6.3	Legislative barriers	30.52	•	20	3

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
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Pillar 7	Market & Linkage Barriers Pillar Score	47.60	•	2	1
7.1	Lack of information on markets	48.36	•	2	1
7.2	Deficiencies in the availability of external services	47.89	•	2	1
7.3	Difficulty in finding cooperation partners	51.64	•	2	1
7.4	Lack of information on technology	45.54	•	3	2
7.5	Market dominated by established firms	44.60	•	4	1
7.6	No need due to very little competition in firm's market	57.28	•	2	1
7.7	Uncertain demand for innovative goods or services	44.60	•	2	1
7.8	Low demand for innovations in your market	42.25	•	2	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
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Pillar 8	Innovation Incidence & Characteristics	30.46	•	7	2
8.1	Firms with new or significantly improved goods	24.41	•	1	1
8.2	Firms with new or significantly improved services	5.63	•	6	1
8.3	Share of new-to-market (NTM) product innovators	41.51	•	17	3
8.4	Firms with at least one type of product innovation developed entirely in-house	96.23	•	14	3
8.5	Firms into innovations in operations and product/process development	15.02	•	7	1
8.6	Firms into innovations in marketing and Sales	8.92	•	6	1
8.7	Firms into innovations in procurement, logistics, and distribution	4.69	•	15	2
8.8	Firms into innovations in administration and management	3.76	•	17	3
8.9	Share of new-to-market (NTM) business process innovators	28.13	•	6	2
8.10	Firms with at least one type of business process innovation developed entirely in-house	83.78	•	8	1

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
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Pillar 9	Innovation Objectives & Outcomes	27.52	•	6	1
Objectives					
9.1	Increase the firm's turnover	30.52	•	8	1
9.2	Increase market presence	33.33	•	8	1
9.3	Reduce costs	27.70	•	8	1
9.4	Product/process enhancement in terms of quality and quantity	29.58	•	7	1
9.5	Reduce environmental impacts	23.94	•	7	1
9.6	Improve health and safety of the firm's employees	23.47	•	7	1
9.7	Meet regulatory requirements (e.g., standards, etc.)	22.54	•	7	1
9.8	Catering to Corporate Social Responsibility	22.54	•	5	1

Outcomes					
9.9	Opened up new market opportunities	25.35	•	5	1
9.10	Responded to existing or forthcoming regulatory provisions	21.13	•	3	1
9.11	Responded to market pressures	26.29	•	3	1
9.12	Responded to cost pressures	25.35	•	4	1
9.13	Improved firm's turnover	25.82	•	6	1
9.14	Firms reporting turnover from new-to-market product innovations	28.30	•	24	4
9.15	Firms reporting turnover from NTM business process innovations	34.38	•	2	1
9.16	Turnover of an innovative firm (% of GSDP per capita)	48.54	•	12	3
9.17	Employment in innovative firms (as a percentage of total employment)	50.69	•	6	1
9.18	Firms that were granted IP rights	21.13	•	6	2
9.19	Firms that attained innovation outcomes through I4.0 technologies	3.76	•	16	3

States in the peer group based on similar GSDP per capita

Assam, Jharkhand, Dadra & Nagar Haveli & Daman & Diu, Chhattisgarh, Himachal Pradesh, Jammu & Kashmir

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation



West Bengal

IMI
Overall
Rank

16

IMI
Score

27.77

Category

IMI Category Rank

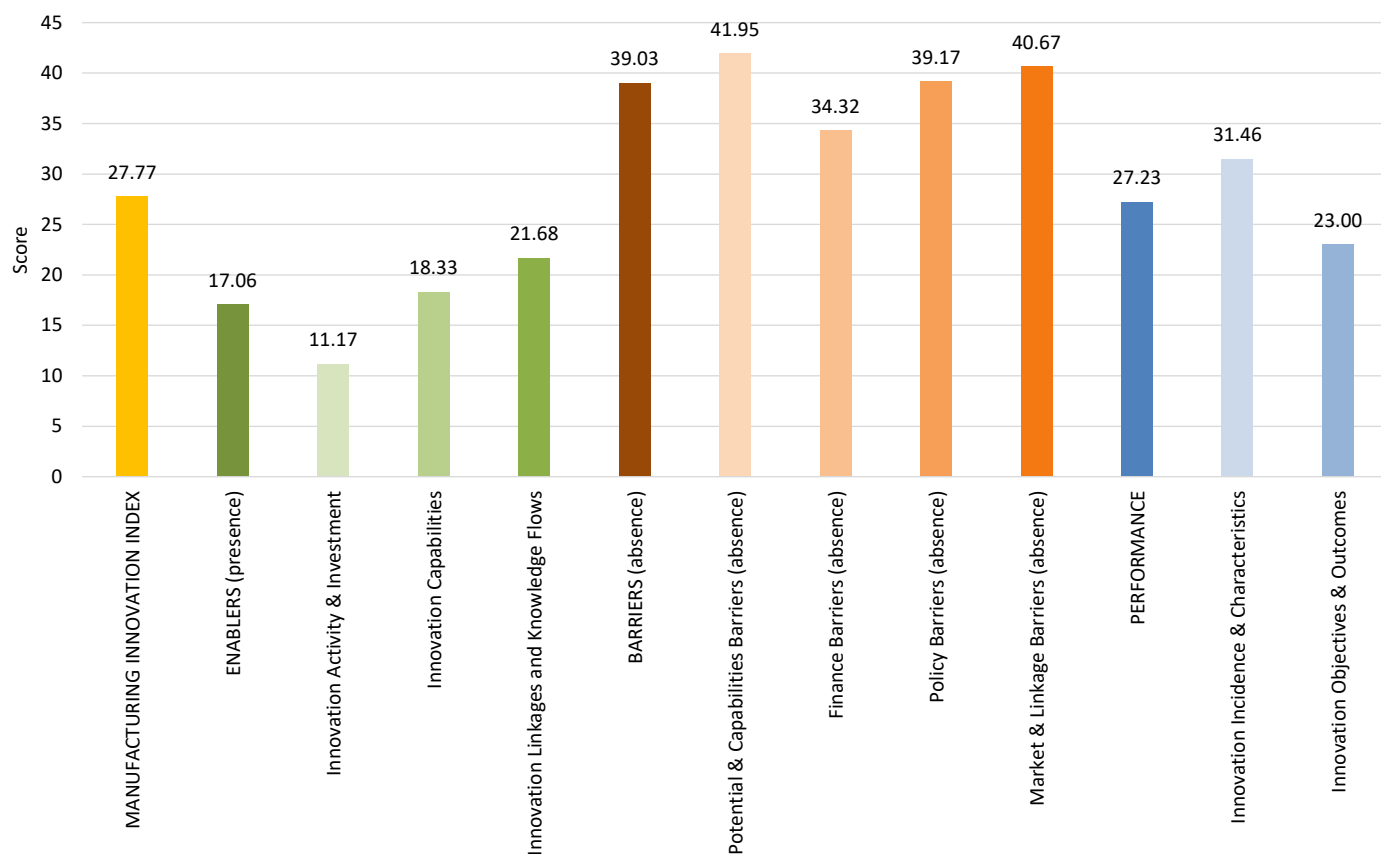
GSDP per capita (INR lakhs)

Major States

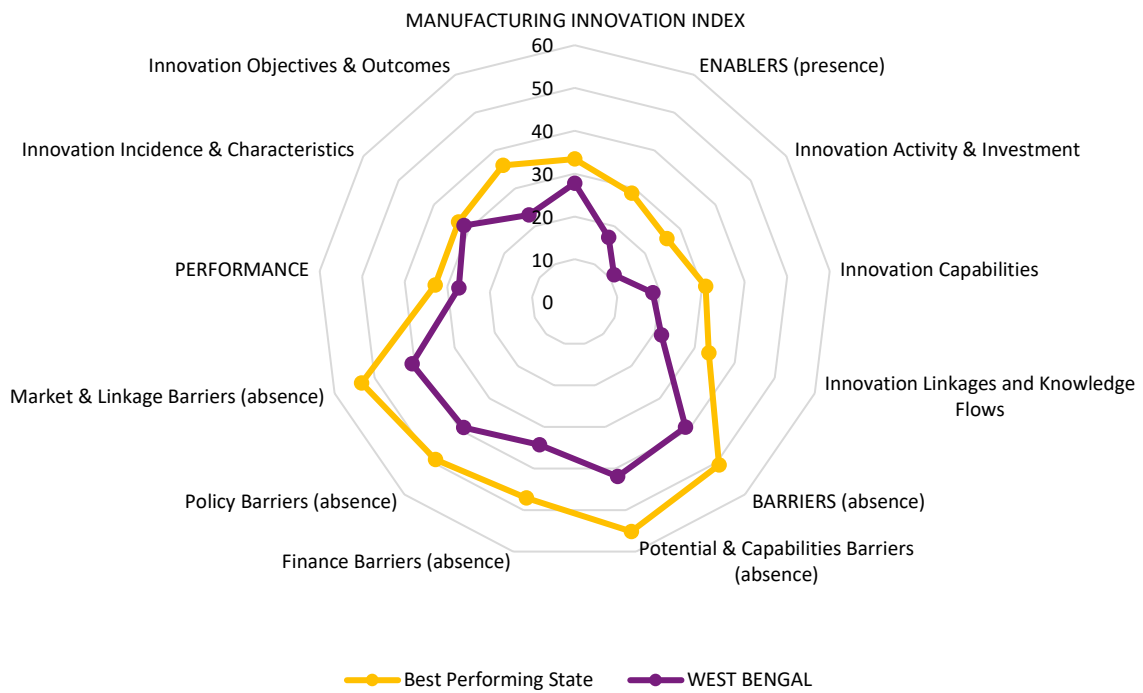
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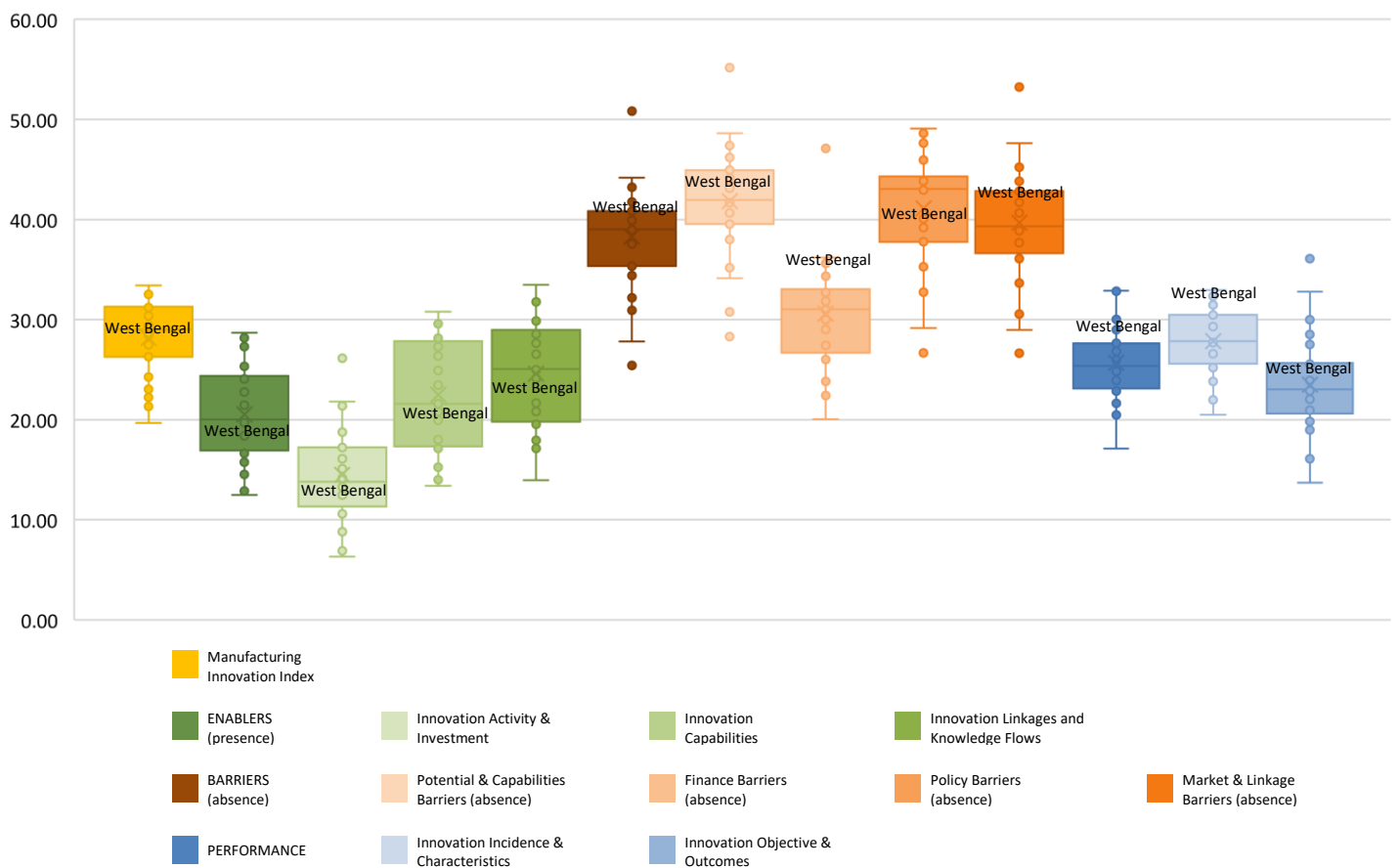
MANUFACTURING INNOVATION SCORES



COUNTRY COMPARISON



RELATIVE PERFORMANCE



IMII Score

27.77

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Enablers	17.06	•	19	12

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Barriers (absence)	39.03	•	14	9

Dimension	Score	Peer Group Performance	Overall Rank	Category Rank
Performance	27.23	•	11	7

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 1	Innovation Activity & Investment	11.17	•	22	14
1.1	Firms engaging in tangible innovation input activities	5.83	•	22	14
1.2	Firms engaging in knowledge-based capital (intangible) activities	9.04	•	23	14
1.3	Firms investing in tangible activities	11.37	•	19	12
1.4	Firms investing in knowledge-based capital (intangible) activities	17.78	•	19	12

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 2	Innovation Capabilities	18.33	•	19	12
2.1	Firms with internal sources of financing	16.91	•	22	15
2.2	Firms with internal funding available for training	13.99	•	24	16
2.3	Firms with R&D Staff	11.95	•	16	9
2.4	Firms using innovative tools and practices among staff that are successful	6.71	•	25	16
2.5	Firms employing/ engaging experts in advanced digital tools in house	18.66	•	19	12
2.6	Firms employing highly qualified personnel, by level of educational attainment	33.53	•	9	5
2.7	Firms highly satisfied with innovation capabilities of employees	41.98	•	20	13
2.8	Firms using advanced, enabling or emerging technologies	3.21	•	22	14
2.9	Firms making use of internal information sources for innovation	27.99	•	22	14
2.10	Firms with an R&D strategy	10.20	•	22	14
2.11	Firms with an I4.0 strategy	2.04	•	22	14

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 3	Innovation Linkages and Knowledge Flows	21.68	•	19	12
3.1	Firms highly satisfied with investment climate in the state	46.36	•	18	11
3.2	Firms highly satisfied with ease of doing business in the state	51.90	•	17	11
3.3	Firms highly satisfied with govt. support for enabling innovation	37.61	•	16	10
3.4	Firms highly satisfied with innovation infrastructure in the state	42.27	•	17	11
3.5	Firms highly satisfied with innovation capabilities of external talent pool	21.87	•	26	18
3.6	Firms with formal cooperation agreements	1.75	•	22	15
3.7	Firms with informal cooperation agreements	5.25	•	15	11
3.8	Firms engaging experts in advanced digital tools from external sources	5.54	•	16	9
3.9	Firms selling products in international markets	18.95	•	18	11
3.10	Firms importing from international markets	6.71	•	19	11
3.11	Firms that collaborated with other parties on innovation activities within India	13.99	•	14	9
3.12	Firms that collaborated with other parties on innovation activities from abroad	2.92	•	16	11
3.13	Firms making use of external information sources for innovation	27.11	•	22	15
3.14	Firms with external sources of financing	3.50	•	24	16
3.15	Firms with external funding available for training	0.87	•	24	17

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 4	Potential & Capabilities Barriers Pillar Score	41.95	•	14	9
4.1	Innovation capabilities (R&D, design, etc.) insufficient	37.61	•	16	10
4.2	Organizational rigidities within the firm	45.19	•	12	8
4.3	No need due to prior innovations by this firm	41.69	•	22	15
4.4	Lack of qualified personnel	39.07	•	11	8
4.5	Lack of good ideas for innovations	45.48	•	15	10
4.6	Lack of firm-level infrastructure	43.15	•	13	8

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 5	Finance Barriers Pillar Score	34.32	•	6	4
5.1	Lack of funds within the firm or group	31.20	•	4	2
5.2	Lack of finance from sources outside the firm (credit)	35.86	•	5	3
5.3	Excessive perceived risks	37.61	•	8	5
5.4	Innovation costs too high	32.65	•	10	6

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 6	Policy Barriers Pillar Score	39.17	•	19	12
6.1	Regulations, standards, taxation	40.52	•	15	10

Peer Group Performance

•

6.2	Weakness of intellectual property rights	45.48	•	18	11
6.3	Legislative barriers	31.78	•	17	11

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 7	Market & Linkage Barriers Pillar Score	40.67	•	13	8
7.1	Lack of information on markets	41.98	•	11	7
7.2	Deficiencies in the availability of external services	40.23	•	11	6
7.3	Difficulty in finding cooperation partners	42.86	•	13	7
7.4	Lack of information on technology	40.82	•	12	8
7.5	Market dominated by established firms	40.82	•	12	8
7.6	No need due to very little competition in firm's market	46.06	•	20	13
7.7	Uncertain demand for innovative goods or services	38.19	•	11	7
7.8	Low demand for innovations in your market	35.28	•	14	10

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 8	Innovation Incidence & Characteristics	31.46	•	4	3
8.1	Firms with new or significantly improved goods	9.91	•	19	11
8.2	Firms with new or significantly improved services	1.75	•	22	15
8.3	Share of new-to-market (NTM) product innovators	62.86	•	2	1
8.4	Firms with at least one type of product innovation developed entirely in-house	100.00	•	3	2
8.5	Firms into innovations in operations and product/process development	9.04	•	21	13
8.6	Firms into innovations in marketing and Sales	5.25	•	19	11
8.7	Firms into innovations in procurement, logistics, and distribution	4.08	•	17	11
8.8	Firms into innovations in administration and management	4.37	•	13	7
8.9	Share of new-to-market (NTM) business process innovators	38.71	•	1	1
8.10	Firms with at least one type of business process innovation developed entirely in-house	81.08	•	13	7

No.	Indicator	Score	Peer Group Performance	Overall Rank	Category Rank
Pillar 9	Innovation Objectives & Outcomes	23.00	•	15	9
Objectives					
9.1	Increase the firm's turnover	19.53	•	24	16
9.2	Increase market presence	19.83	•	26	17
9.3	Reduce costs	18.37	•	23	15
9.4	Product/process enhancement in terms of quality and quantity	18.95	•	22	15
9.5	Reduce environmental impacts	16.33	•	23	15
9.6	Improve health and safety of the firm's employees	16.33	•	20	13
9.7	Meet regulatory requirements (e.g., standards, etc.)	16.03	•	21	15
9.8	Catering to Corporate Social Responsibility	14.58	•	20	13
Outcomes					
9.9	Opened up new market opportunities	13.41	•	23	14
9.10	Responded to existing or forthcoming regulatory provisions	11.08	•	18	11
9.11	Responded to market pressures	13.70	•	21	13
9.12	Responded to cost pressures	13.12	•	21	14
9.13	Improved firm's turnover	13.41	•	22	14
9.14	Firms reporting turnover from new-to-market product innovations	62.86	•	1	1
9.15	Firms reporting turnover from NTM business process innovations	51.61	•	1	1
9.16	Turnover of an innovative firm (% of GSDP per capita)	80.61	•	5	5
9.17	Employment in innovative firms (as a percentage of total employment)	39.47	•	17	12
9.18	Firms that were granted IP rights	17.20	•	14	9
9.19	Firms that attained innovation outcomes through I4.0 technologies	2.04	•	23	15

States in the peer group based on similar GSDP per capita

Rajasthan, Andhra Pradesh, Telangana, New Delhi, Madhya Pradesh, Kerala

Peer Group Performance

- Performing above expectation¹
- Performing in line with expectation²
- Performing below expectation³

¹ Greater than national average plus standard deviation

² Between national average plus standard deviation and national average minus standard deviation

³ Less than national average minus standard deviation



9

CONCLUSION

CONCLUSION

9.1 KEY TAKEAWAYS

1. Innovation performance (output) lags behind presence of enablers and absence of barriers (input)

The frequency of reported innovation performance is lower than the frequencies of reported presence of enablers and reported absence of barriers. The external enabling environment (linkages and knowledge flows) and the firms' internal capabilities would be expected to translate into innovation activities and investments made by firms, for better innovation outputs and outcomes, i.e., performance. For the enablers and absence of barriers to translate to actual innovations (performance), more efforts (in terms of innovation activities and investments, as well as the efficient utilization of the internal firm capabilities and the enabler ecosystem) are needed in the Indian manufacturing context¹²⁶. In addition, firms with investments in both tangible innovation activities (capital assets) and intangible (knowledge-based capital), tend to be successful innovators and these

activities are also concentrated in the states that are high on the innovation index.

2. Presence of enablers has greater impact on performance than the absence of barriers

The presence of enablers (such as innovation input activities¹²⁷, government support and access to market information) is statistically positively correlated¹²⁸ with both lower frequencies of reported barriers (such as lack of access to financing), and higher frequencies of reported performance (innovation outputs and outcomes). This means that one-unit increase in the presence of enablers did correlate with an increase of 0.6780 in the presence of innovations, and one-unit increase in the absence of barriers did correlate with an increase 0.0249 in the presence of innovations. It is the higher presence of enablers that sets the leaders (best performing states on the IMII separate from the rest. Such top performers, Karnataka and Telangana – are doing markedly better on the two pillars contributing to enablers, particularly innovation activities and investment. Telangana scored the highest on innovation activities and investment

¹²⁶ Overall, the IMII value is 28.17 as seen in Figure 4.1. In the IMII, presence of enablers and absence of barriers, in other words inputs, contribute to the performance, in other words outputs and outcomes. The performance dimension at 25.68, is less than the inputs at 29.41 (average of enablers at 20.52 and barriers (absence) at 38.31). In other words, the innovation output is not commensurate with the inputs. Among enablers, innovation activity and investment pillar has the lowest score at 14.48.

¹²⁷ Tangible and intangible (knowledge-based capital) innovation activities such as acquisition of plant, machinery and equipment, internal and external R&D, engineering, design and creative work activities, marketing and brand equity, employee training, IP related activities and innovation management activities.

¹²⁸ The correlation coefficient for presence of enablers with performance is 0.6780, and the correlation coefficient for absence of barriers with performance is 0.0249.

resulting in innovation performance, which is also reflected in the share of innovative firms. DNH&DD also fares high on enabler scores and is one of the best performers in terms of innovation performance.

3. Innovation is beneficial to business success in manufacturing

Of the 25% firms reporting innovations in the survey, 83% had increased turnover, 80% opened new market opportunities, 77% responded to market pressures and 71% responded to cost pressures. Even as just a quarter of respondent manufacturing firms reported innovations, and with the challenges encountered, there is a good business rationale for innovation in manufacturing.

4. At least 70 percent of the firms are innovation-inactive

16.32% of the firms surveyed were identified as innovation-active, meaning they engaged during the observation period of the survey in any innovation input activity with an intention to produce either a product or business process innovation. Out of innovation-active firms, only 54.40% reported innovation activities that were not abandoned, incomplete or seriously delayed during the observation period. On the other hand, 69.93% of the firms surveyed were innovation-inactive with no innovation input activity.

5. Aspiration for topline growth drives innovation, but it could also be at odds with innovation

Most firms are driven to innovate by the objectives of increasing market presence and increasing turnover. Enhancing product quality and quantity and reducing costs are other key objectives. In other words, firms will pursue innovations provided they see topline returns. Topline-driven innovation objective combined with the inherent risky nature of innovation and limited entrepreneurial competence to take calculated business risks, may keep firms away from pursuing innovations. The immediate focus on topline growth and long-term determination to achieve innovation success could be at odds. Increasing the risk appetite of firms through appropriate measures and improved competencies could address this concern.

6. Activities exclusively focused on innovation correlate to higher innovation success

Activities specifically aimed at innovation appear to correlate with higher innovation performance, which saw more than 80% success rate (see figure 5.5). However, less than 10% of firms engaged in each of the innovation input activities exclusively “in pursuit of innovation”¹²⁹. Less than 20% of firms engaged in each of the innovation input activities “regardless of their purpose”¹³⁰ that may or may not impact their innovation outputs. On the other hand, while a higher proportion of firms engaged in innovation activities regardless of their

¹²⁹ varying between 1% to 9% for each activity

¹³⁰ varying between 1% to 19% for each activity

purpose, success rates for these activities were found to be lower. In other words, innovation intent in undertaking enabling activities is critical for success.

7. Firms with more than basic innovation capabilities demonstrate higher success in innovation.

Firms with staff using innovative tools, an Industry 4.0 strategy, an R&D strategy, internal sources of financing and advanced and enabling technologies have better innovation performance, although these capabilities are reportedly scarce as compared to other capabilities such as employing highly qualified personnel and internal information sources (see Figure 5.15).

8. Basic ecosystem enablers are essential but insufficient on their own to help firms increase their ability to innovate

Firms collaborating with foreign partners, accessing external sources of financing, and entering into formal cooperation agreements demonstrate higher innovation success as compared to those that don't. Other indicators such as satisfaction rate of firms with respect to EODB, investment climate, innovation infrastructure and government support for enabling innovation in the state, although high in frequency were low in success to achieve innovation outcomes. In other words, those basic ecosystem enablers are essential but insufficient on their own to help firms increase their innovation performance. For instance, among the major states, Gujarat had the highest satisfaction rate with the innovation ecosystem (innovation linkages

and knowledge flows). Karnataka, Kerala, and Maharashtra also scored well, yet, Karnataka topped the IMII, primarily because its firms most frequently undertake innovation activities.

9. Finance is the most cited barrier to innovation in Indian manufacturing

The most frequent barriers were the lack of funds within the firm or group, high innovation costs and lack of financing from external sources, reported by 46.15%, 40.30% and 39.52% of firms, respectively. Whereas the most critical barriers, i.e., the frequency of firms that were not successful in introducing innovations out of the firms that reported the impact of a barrier, were low demand for innovations in the market, organizational rigidities within the firm, lack of funds within the firm or group and lack of finance from external sources, reported by 71.23%, 69.28%, 68.57% and 68.38% of firms, respectively. Small firms reported the highest frequencies of all barriers across firm sizes, even more than micro enterprises. Finance was most frequently reported as a barrier by firms of all sizes.

10. Frequencies of innovation barriers differ by region in India

Gujarat and DNH&DD reported the highest frequencies of barriers to innovation. They are among the more industrialized states/UTs in India and have a higher concentration of established businesses and industries such as chemicals, textiles, plastics, pharmaceuticals and electronics. These factors can contribute to higher barriers to innovation as existing firms may be less willing to take risks on new

technologies and processes and may have more entrenched organizational structures and cultures. Highly innovative states such as Telangana, Karnataka, Maharashtra, Tamil Nadu, also reported average to high (higher than national average) frequencies of barriers. Highly innovative states such as Telangana, Karnataka, Maharashtra, and Tamil Nadu have invested heavily in creating supportive innovation ecosystems, such as technology parks, incubators, and accelerators. While these initiatives have spurred innovation, they have also led to higher expectations and standards for innovation, in which may have contributed to higher frequencies of barriers. Interestingly, some of the low innovative

states also reported low frequencies in barriers, such as Uttar Pradesh, West Bengal, North-eastern states (excluding Assam), Odisha and Andhra Pradesh. Insufficient innovation potential and lack of qualified personnel were the most frequent barriers related to potential and capability nationwide as well as in most states, irrespective of their innovation rank. This suggests that there may be a shortage of skilled professionals with the necessary training and experience to drive innovation forward. This shortage could be due to a variety of factors, including inadequate education and training programs, brain drain to other countries, and competition for talent among industries.

9.2 POLICY DIRECTIONS

From the evidence and learnings from the NMIS 2021-22 assessment of firm-level innovations, a few key policy directions are drawn that need priority action and are succinctly presented below, especially for the consideration of experts and policymakers.

1. **‘Innovate to Make in India’ as a manufacturing innovation strategy**

The survey findings demonstrate that despite proven business benefits, manufacturing firms showed high-risk aversion and limited entrepreneurial appetite to engage with innovation. Predominantly, it was observed that firms were responding to the immediate demands in the market, instead of competing for new products that are needed to compete in the future. In this context, a long-term manufacturing innovation strategy is critically urgent. Thus, to make innovation a priority for manufacturing firms, a concrete step forward would be to complement the ‘Make in India’ with an “Innovate to Make in India” strategy. This may then include broad based awareness, promotional measures and investment incentives, along with sectoral sub-strategies with concrete innovation targets or roadmaps.

2. **Support pre-competitive, collaborative industry focused research and innovation**

The NMIS survey found low evidence of effective future-oriented collaborations in research and innovations, among firms and with innovation stakeholders. There is no evidence for - and potentially a low interest – in the development of a pre-competitive knowledge and innovation base that multiple firms and possible sectors can benefit from,

i.e., with their own and different new products and technologies. This would require partnerships between companies in the same industry that collaborate on research, development, and innovation projects, which benefit the industry as a whole. While such collaboration between industry competitors can appear counterintuitive and therefore resisted, lessons from innovative nations show a strong government arm can facilitate and even mandate such collaboration. Such interventions can be dedicated in GoI R&D programmes for large scale and long-term funding allocation for pre-competitive industry focused research and innovations, where collaboration can be mandated as a qualifying criterion for accessing any research grant. The Government may consider to launch funding allocation for pre-competitive, collaborative industry focused research and innovation, drawing inspiration from the success of similar programmes in countries as diverse as Australia, UK, Germany, The Netherlands, Israel, Japan and Republic of Korea.

3. **Enhance state government participation for fostering innovation in MSMEs**

State governments are better connected with MSMEs and are a vital link in the delivery of MSME-oriented policy and incentive schemes. This is true for innovation as well. The State governments can use the data generated through the NMIS survey, along with the results of the India Innovation Index 2022. Together they provide valuable and specific areas where their targeted response can make a difference. The overarching barriers to

innovations observed in the systems of innovations¹³¹ offer strong baselines for updating and orienting various MSMEs schemes. The design of future initiatives to amplify manufacturing productivity and competitiveness may examine existing policy success using the manufacturing innovation and SSI lenses. In addition, significant differences exist between states in innovation enablers, barriers and performance leaving ample scope for cross learning and benchmarking.

4. Implement innovation-linked incentive schemes across sectors

The government may consider fiscal and non-fiscal mechanisms to help firms improve their risk appetite in pursuit of innovation. Innovation-linked incentive scheme could be launched to help firms, especially MSMEs, to address the financial risks linked to innovation uncertainty. To this end, Government should co-fund all research, even research and innovation that fails. While the benefits of the scheme can be linked to the output and outcome indicators, the purpose is to help firms address internal enablers and barriers, hence it is particularly important to include innovation failure as a potential outcome, and the related learnings are captured.

5. Support firms mitigate innovation-related risks

Firms often face risks in their pursuit of innovation, which can act as a deterrent to progress. These risks are further magnified by various other barriers such as inadequate access to external funding, high innovation

costs, insufficient market linkages, and uncertain market demand. To support firms in overcoming these obstacles, the government can implement both fiscal and non-fiscal measures to encourage firms to take calculated risks and engage in innovation.

6. Increase private sector innovation investment through crowding-in

India is one of the countries with high public sector funding in innovation. The government may redirect some of its innovation expenditure for purposes of crowding in private sector funding and participation in innovation. Success factors of successful schemes such as Start-up India could be adopted for similar crowding in of private sector investment with appropriate suitability to the characteristics of innovation life-cycle.

7. Improve the quality and availability of firm-level and sectoral data on innovation

Government may regularly update data on innovation indicators especially in manufacturing and related services such as R&D expenditure in manufacturing, investment on advanced technologies, turnover and investment by manufacturing firms and employment data of manufacturing firms with respect to R&D. With this the government's data on innovation in Indian manufacturing will significantly improve, and it will be latest to the reporting year, thus addressing the data gaps and lags. More importantly, the government will have a more accurate picture of innovation trends and can dynamically respond with appropriate policies.

¹³¹ In the 5 sectors studied under NMIS 2021-22, barriers are grouped across Policy function, Market, Human Capital, ICT Knowledge and Flows, Knowledge Stocks and Function and Industry 4.0.

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Annexure

TABLE A.1: Composition of population, sample and response rate state-wise

Sr.no.	States	Population	Sample	Response	Response rate (response/sample)
1	A&N islands	20	19	12	63%
2	Andhra Pradesh	14625	374	390	104%
3	Arunachal Pradesh	126	95	26	27%
4	Assam	4824	356	219	62%
5	Bihar	3343	345	334	97%
6	Chandigarh	481	214	111	52%
7	Chhattisgarh	3414	345	322	93%
8	Dadra & Nagar haveli	1292	296	193	65%
9	Daman & Diu	1617	311	227	73%
10	Goa	786	258	175	68%
11	Gujarat	26912	379	404	107%
12	Haryana	11260	372	341	92%
13	Himachal Pradesh	2685	336	226	67%
14	Jammu & Kashmir	959	274	184	67%
15	Jharkhand	2767	337	321	95%
16	Karnataka	13604	374	335	90%
17	Kerala	7229	365	271	74%
18	Ladakh	1	1	1	100%
19	Madhya Pradesh	4551	354	337	95%
20	Maharashtra	32104	380	433	114%
21	Manipur	212	137	13	10%
22	Meghalaya	187	126	14	11%
23	Mizoram	217	139	6	4%
24	Nagaland	184	125	12	10%
25	NCT of Delhi	8864	368	334	91%
26	Odisha	3100	342	313	92%
27	Puducherry	692	247	172	70%
28	Punjab	11803	372	305	82%
29	Rajasthan	8798	368	385	105%
30	Sikkim	65	56	8	14%
31	Tamilnadu	37066	380	348	92%
32	Telangana	14398	374	353	94%
33	Tripura	597	234	52	22%
34	Uttar Pradesh	15486	375	354	94%
35	Uttarakhand	2911	339	213	63%
36	West Bengal	11107	371	343	92%
	Total	248287	10139	8087	80%

TABLE A.2: Composition of population, sample and response rate state-wise

S.N.	GROUPED SECTORS	POPULATION	SAMPLE	RESPONSE	RESPONSE RATE
1	Mining and Related Activities (NIC 5-9)	457	17	11	65%
2	Food and Beverages (NIC 10 & 11)	37444	1652	1505	91%
3	Tobacco products (NIC 12)	2928	114	59	52%
4	Textiles and Apparels (NIC 13 & 14)	28394	754	635	84%
5	Leather and related products (NIC 15)	4425	129	58	45%
6	Wood and related products (NIC 16)	4453	288	155	54%
7	Paper and related products (NIC 17)	7001	313	288	92%
8	Printing and reproduction of recorded media (NIC 18)	4244	150	101	67%
9	Coke and refined petroleum products (NIC 19)	1624	123	79	64%
10	Chemicals and chemical products (NIC 20)	13321	498	436	88%
11	Pharmaceuticals, medicinal chemical and botanical products (NIC 21)	5795	302	259	86%
12	Rubber and plastics products (NIC 22)	14164	767	685	89%
13	Other non-metallic mineral products (NIC 23)	26740	1448	1032	71%
14	Basic metals (NIC 24)	12533	591	438	74%
15	Fabricated metal products, except machinery and equipment (NIC 25)	17223	576	417	72%
16	Computer, Electronic and Electrical Equipment (NIC 26 & 27)	10714	477	357	75%
17	Machinery and equipment (NIC 28)	12018	331	301	91%

18	Motor vehicles, trailers and semi-trailers (NIC 29)	6004	205	168	82%
19	Other transport equipment (NIC 30)	2011	81	57	70%
20	Furniture (NIC 31)	1650	88	61	69%
21	Other and Diversified Manufacturing (NIC 32 & 34)	5486	185	184	99%
22	Electricity, gas, steam and air conditioning supply (NIC 35)	1957	84	54	64%
23	Water Supply, Sewerage, and Other waste management services (NIC 36 - 38)	550	21	16	76%
24	Construction and Related Activities (NIC 41 - 43)	3750	121	60	50%
25	Wholesale and retail trade and repair of motor vehicles and motorcycles (NIC 45)	6719	282	169	60%
26	Wholesale trade, except of motor vehicles and motorcycles (NIC 46)	6894	219	234	107%
27	Retail trade, except of motor vehicles and motorcycles (NIC 47)	608	18	29	161%
28	Transportation (NIC 49 & 51)	292	10	7	70%
29	Warehousing and support activities for transportation (NIC 52)	3075	107	89	83%
30	Accommodation (NIC 55)	669	32	22	69%
31	Information and Communication (NIC 58 - 63)	2599	74	50	68%
32	Professional, scientific and technical activities (NIC 70 - 74)	1572	47	50	106%
33	Repair and installation of machinery and equipment and computers, personal and household goods (NIC 33 & 95)	758	31	19	61%
Total		248072	10135	8085	80%

TABLE A.3: Weightage of indicators dimension-wise

DIMENSIONS	INDICATORS (share of firms in %)	WEIGHTAGE	WEIGHTS OUT OF 1
ENABLERS (PRESENCE)	Pillar 1: Innovation Activities and Investment		
	Share of firms that engaged in tangible activities for innovation	0.239	0.274
	Share of firms that engaged in knowledge-based capital (KBC) or intangible activities for innovation	0.202	0.232
	Share of firms that invested in tangible activities for innovation	0.179	0.205
	Share of firms that invested in KBC or intangible activities for innovation	0.252	0.289
	Pillar 2: Innovation Capabilities		
	Share of firms with internal sources of financing available for innovation activities	0.089	0.121
	Share of firms that used innovative tools and practices among staff that are successful	0.079	0.107
	Share of firms highly satisfied with innovation capabilities of employees	0.073	0.098
	Share of firms that made use of internal information sources for innovation	0.068	0.092
	Share of firms that used advanced, enabling or emerging technologies	0.057	0.078
	Share of firms with an R&D strategy	0.046	0.062
	Share of firms that employed highly qualified personnel, by level of educational attainment	0.091	0.123
	Share of firms with R&D staff	0.070	0.095
	Share of firms that employed experts in Industry 4.0 and advanced digital tools ¹³² in house	0.066	0.090
	Share of firms with an I4.0 strategy	0.050	0.068
	Share of firms with internal funding available for training	0.050	0.067
	Pillar 3: Innovation Linkages & Knowledge Flows		
	Share of firms highly satisfied with investment climate in the state	0.075	0.093
	Share of firms highly satisfied with ease of doing business in the state	0.074	0.092
	Share of firms highly satisfied with govt. support for enabling innovation	0.070	0.087

¹³² engineering or applied sciences/ mathematics or statistics or database management/ design of products/ software development/ multimedia/ web design/ market research/ graphic arts/ layout/ advertising.

	Share of firms highly satisfied with innovation infrastructure in the state	0.066	0.083
	Share of firms highly satisfied with innovation capabilities of external talent pool	0.054	0.068
	Share of firms with formal cooperation agreements for innovation	0.045	0.055
	Share of firms that engaged experts in Industry 4.0 and advanced digital tools ¹³³ from external sources	0.041	0.050
	Share of firms that exported to international markets	0.041	0.050
	Share of firms that imported from international markets	0.032	0.040
	Share of firms with informal cooperation for innovation	0.062	0.077
	Share of firms that collaborated with Indian entities on innovation activities	0.058	0.073
	Share of firms that collaborated with foreign entities on innovation activities	0.035	0.044
	Share of firms making use of external information sources for innovation	0.025	0.031
	Share of firms with external sources of financing for innovation activities	0.066	0.082
	Share of firms with external funding available for training	0.060	0.075
BARRIERS (ABSENCE)	Pillar 6: Potential & Capabilities Barriers (absence)		
	Share of firms that reported no impact of insufficient innovation capability (R&D, design, etc.) on innovation activities	0.122	0.177
	Share of firms that reported no impact of organizational rigidities (inflexibility) within the firm on innovation activities	0.123	0.178
	Share of firms that reported no impact of lack of need due to prior innovations by the firm on innovation activities	0.116	0.168
	Share of firms that reported no impact of lack of qualified personnel on innovation activities	0.108	0.157
	Share of firms that reported no impact of lack of good ideas for innovations on innovation activities	0.091	0.131
	Share of firms that reported no impact of lack of firm-level infrastructure on innovation activities	0.130	0.189
	Pillar 7: Financing Barriers (absence)		
	Share of firms that reported no impact of lack of funds within the firm or group on innovation activities	0.187	0.281
	Share of firms that reported no impact of lack of finance from sources outside the firm (credit) on innovation activities	0.141	0.212
	Share of firms that reported no impact of excessive perceived risks on innovation activities	0.188	0.282

¹³³ engineering or applied sciences/ mathematics or statistics or database management/ design of products/ software development/ multimedia/ web design/ market research/ graphic arts/ layout/ advertising.

PERFORMANCE	Share of firms that reported no impact of innovation costs too high on innovation activities	0.149	0.224
	Pillar 8: Policy Barriers (absence)		
	Share of firms that reported no impact of regulations, standards, and taxation in hampering innovation activities	0.311	0.329
	Share of firms that reported no impact of weakness in protection, acquisition and/or utilization of intellectual property rights on innovation activities	0.312	0.330
	Share of firms that reported no impact of legislative barriers on innovation activities	0.323	0.341
	Pillar 9: Market & Linkage Barriers (absence)		
	Share of firms that reported no impact of lack of information on markets on innovation activities	0.110	0.144
	Share of firms that reported no impact of deficiencies in the availability of external services on innovation activities	0.109	0.142
	Share of firms that reported no impact of difficulty in finding cooperation partners on innovation activities	0.106	0.138
	Share of firms that reported no impact of lack of information on technology on innovation activities	0.103	0.134
	Share of firms that reported no impact of market dominance by established firms on innovation activities	0.088	0.115
	Share of firms that reported no impact on innovation activities because of lack of incentive to innovate due to very little competition in firm's market	0.076	0.099
	Share of firms that reported no impact of uncertain demand for innovative goods or services on innovation activities	0.062	0.081
	Share of firms that reported no impact of low demand for innovations in the market on innovation activities	0.114	0.149
	Pillar 4: Innovation Incidence & Characteristics		
	Share of firms with new or significantly improved goods	0.088	0.096
	Share of firms with new or significantly improved services	0.086	0.094
	Share of firms into innovations in operations and product/process development	0.075	0.083
	Share of firms into innovations in marketing and sales	0.110	0.121
	Share of firms into innovations in procurement, logistics, and distribution	0.094	0.103
	Share of firms into innovations in administration and management	0.090	0.099
	Share of firms that reported new-to-market (NTM) product innovations	0.091	0.099
	Share of firms that reported NTM business process innovations	0.110	0.121
	Share of firms that reported in-house product innovations	0.112	0.123

Share of firms that reported in-house business process innovations (BPI)	0.055	0.060
Pillar 5: Innovation Objectives & Outcomes		
Innovation Objectives		
Share of firms that reported innovation objective of increasing their turnover	0.058	0.065
Share of firms that reported innovation objective of increasing their market presence	0.057	0.064
Share of firms that reported innovation objective of enhancing product/process in terms of quality and quantity	0.056	0.063
Share of firms that reported innovation objective of reducing environmental impacts	0.055	0.062
Share of firms that reported innovation objective of reducing costs	0.055	0.062
Share of firms that reported innovation objective of improving health and safety of their employees	0.055	0.062
Share of firms that reported innovation objective of meeting regulatory requirements (e.g. standards, etc.)	0.051	0.057
Share of firms that reported innovation objective of catering to Corporate Social Responsibility	0.049	0.055
Innovation Outcomes		
Share of firms that reported improvement in their firm's turnover as a result of innovations	0.049	0.055
Share of firms that reported opening up of new market opportunities as a result of innovations	0.049	0.055
Share of firms that were able to respond to market pressures as a result of innovations	0.045	0.051
Share of firms that were able to respond to cost pressures as a result of innovations	0.042	0.047
Share of firms that were able to respond to existing or forthcoming regulatory provisions as a result of innovations	0.033	0.037
Share of firms that attained any of the above outcomes through I4.0 technologies	0.029	0.033
Share of firms that were granted IP rights	0.049	0.055
Share of firms that reported turnover from new-to-market product innovations	0.045	0.051
Share of firms that reported turnover from NTM business process innovations	0.048	0.054
Employment in innovative firms (as a percentage of total employment)	0.038	0.043
Turnover of an innovative firm (% of GSDP per capita)	0.028	0.031

National Firm-Level Innovation Questionnaire

Section A: General Information

1. Description of Business Activity of the Firm

1.1 Name of firm:	_____
1.2 Address:	_____
1.3 Website:	_____
1.4 Email ID:	Company email ID: _____ Personal email ID: _____
1.5 Year of start of operations:	_____
1.6 Main business activity of firm:	[Drop-down menu - NIC 2008 - 2 digits]
1.7 Branch of industrial sub-activity:	[Drop-down menu - NIC 2008 - 4 digits]

1.8 Ownership structure of the firm

	Please tick all that apply
Family business	<input type="checkbox"/>
Sole proprietorship	<input type="checkbox"/>
Partnership Firm	<input type="checkbox"/>
Private Limited Company	<input type="checkbox"/>
Public limited company	<input type="checkbox"/>
Limited Liability Partnership	<input type="checkbox"/>
Public Sector Undertaking	<input type="checkbox"/>
Cooperative	<input type="checkbox"/>
Others (please specify): _____	<input type="checkbox"/>

1.9 Is the firm part of an enterprise group?

Yes	<input type="checkbox"/>	(If the firm is part of an enterprise group, please provide responses for the firm only; exclude subsidiaries or parent firm)
No	<input type="checkbox"/>	

1.9.1 Is the firm the head office of the enterprise group?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

If No, please indicate the address of the head office: _____

1.9.2 Number of manufacturing units of the firm located in:

India: _____
Abroad: _____

1.10 Please tick the appropriate range of annual turnover, investment and exports below

Range (INR)	Annual turnover		
	FY 2017-18	FY 2018-19	FY 2019-20
≤ 40 lakh (GST exempt)			
40 lakh – 1 Crore			
1 crore – 5 Crores			
5 - 50 crore			
50 – 250 Crore			
> 250 crore			

Range (INR)	Investment*	Annual exports		
	FY 2019-20	FY 2017-18	FY 2018-19	FY 2019-20
< 40 lakh				
40 lakh – 1 crore				
1 crore – 5 crore				
5 - 10 crore				
10 - 50 crore				
> 50 crore				

*Investment in plant & machinery or equipment

1.11 Please indicate the geographic export and import markets of the firm in FY 2019-20

Country/ Region	Exports	Imports	Largest export market (in terms of turnover)	Largest import market (in terms of turnover)
Drop down list of all countries				

Section B: Type of Innovation

2. Product Innovation

2.1 In the last three financial years (FY 2017-18, FY 2018-19 and FY 2019-20), did the firm introduce?

	Yes	No
a) New or significantly improved goods		
b) New or significantly improved services		

If Yes to a or b, please briefly describe the type(s) of product innovation introduced:

If No to a and b, go to 3.1.

2.2 Who developed these product innovations?

Please tick all that apply

The firm by itself
With domestic firms
With foreign firms
With government agencies
With domestic public and private universities
With foreign universities
With domestic R&D and technology centers
With foreign R&D and technology centers
With industrial associations
With other firms in the enterprise group

2.3 Were any of the firm's product innovations (goods or services) in FY 2017-18, FY 2018-19 and FY 2019-20?

	Yes	No	Don't know
New to the market			
Only new to the firm			
A first in India			
A first in Asia			
A world first			

If Yes to any of the above options, please briefly describe these product innovations

2.4 What percentage of the firm's total turnover in FY 2019-20 emanated from the following?

	0%	0 – 5%	5 - 10%	10 - 25%	25 - 50%	50 – 75%	75 - 100%
New or significantly improved products that were <i>new to the market</i>							
New or significantly improved products that were <i>only new to the firm</i>							
A first in India							
A first in Asia							
A world first							

2.5 How important were the firm's product innovations in realizing the following outcomes?

	Very imp	Imp	Neutral	Not so imp	Irrelevant
Open up new market opportunities					
Improve firm's turnover					
Respond to market pressures					
Respond to cost pressures					
Respond to existing or forthcoming					

3. Business Process Innovation – Operations and Product or Business Process Development

3.1 In the last three financial years (FY 2017-18, FY 2018-19 and FY 2019-20), did the firm introduce?

	Yes	No
a) New or significantly improved operations which transform inputs into final outputs, either goods or services (<i>including assembling products, producing goods, providing services, managing production, managing services, fabricating components, and conducting quality assurance or quality control</i>)		
b) New or significantly improved product or service development activities, associated with bringing a new, improved, or redesigned product or service to market (<i>such as developing business plans, developing products or services, researching products or services, analyzing markets, designing products or services, and testing</i>)		
c) New or significantly improved technology and process development activities related to maintenance, automation, design or redesign of equipment, hardware, software, procedures, and technical knowledge (<i>such as developing computer systems, providing internet services, maintaining or repairing computer systems, designing processes, engineering, managing data, developing and testing software, processing data, and providing software and information technology services</i>)		

If Yes to a, b or c, please briefly describe the type(s) of business process innovation introduced in operations and product or business process development: _____

If No to all options, go to 4.1.

3.2 Who developed these business process innovations in operations and product or business process development?

Please tick all that apply

The firm by itself
With domestic firms
With foreign firms
With government agencies
With domestic public and private universities
With foreign universities
With domestic R&D and technology centers
With foreign R&D and technology centers
With industrial associations
With other firms in the enterprise group

3.3 In the last three financial years (FY 2017-18, FY 2018-19 and FY 2019-20), were any of the firm's business process innovations in operations and product or business process

	Yes	No	Don't know
New to the market			
Only new to the firm			
A first in India			
A first in Asia			
A world first			

If Yes to any of the above options, please briefly describe these business process innovations _____

3.4 What percentage of the firm's total turnover in FY 2019-20 emanated from the following?

	0%	0 – 5%	5 - 10%	10 - 25%	25 - 50%	50 – 75%	75 - 100%
New or significantly improved products that were <i>new to the market</i>							
New or significantly improved products that were <i>only new to the firm</i>							
A first in India							
A first in Asia							
A world first							

3.5 How important were the firm's business process innovations in operations and product or business process development in realizing the following outcomes?

	Very imp	Imp	Neutral	Not so imp	Irrelevant
Open up new market opportunities					
Improve firm's turnover					
Respond to market pressures					
Respond to cost pressures					
Respond to existing or forthcoming					

4. Business Process Innovation – Marketing and Sales

4.1 In the last three financial years (FY 2017-18, FY 2018-19 and FY 2019-20), did the firm introduce?

	Yes	No
a) Significantly improved activities aimed at informing existing or potential buyers of a good or service (<i>such as new media or techniques for product promotion, advertising, branding, conducting market research, telemarketing</i>)		
b) Significant changes to the aesthetic design or packaging of a good or service		
c) New methods for product placement or sales channels (<i>such as retail management activities</i>)		
d) New methods of pricing goods or services		
e) Significantly improved aftersales service activities (<i>including customer relations, training, help desks, call centers, maintaining and repairing products, and customer support for guarantees and warranties</i>)		

If Yes to a, b, c, d or e, please briefly describe the type(s) of marketing innovation introduced: _____

If No to all options, go to 5.1.

4.2 Who developed these innovations in marketing and sales?

Please tick all that apply

The firm by itself
With domestic firms
With foreign firms
With government agencies
With domestic public and private universities
With foreign universities
With domestic R&D and technology centers
With foreign R&D and technology centers
With industrial associations
With other firms in the enterprise group

4.3 How important were the firm's innovations in marketing and sales in realizing the following outcomes?

	Very imp	Imp	Neutral	Not so imp	Irrelevant
Open up new market opportunities					
Improve firm's turnover					
Respond to market pressures					
Respond to cost pressures					
Respond to existing or forthcoming					

5. Business Process Innovation – Procurement, Distribution and Logistics

5.1 In last three financial years (FY 2017-18, FY 2018-19 and FY 2019-20), did the firm introduce any of the following innovations in procurement, distribution and logistics?

	Yes	No
a) Digital inventory management systems (such as automatic and real-time monitoring, tracking/ tracing of delivery of goods)		
b) Digital supply chain management (includes paperless, transparent supply chain transactions, manage supplier relations, unique and automatic identification of products within supply chain, and control associated business processes)		
c) E-procurement		
d) Reverse logistics (all operations related to the re-use and return of products and materials)		
e) New delivery models (including use of eco-friendly vehicles or multi-modal logistics such as the combined use road transport and inland navigation)		
f) Improved shipment by redesign (packaging, weight, density)		
g) Other (please specify):		

5.2 In FY 2019-20, what percentage of the firm's operating expenses were for logistics?

0%	
0 – 25%	
25 – 50%	
50 – 75%	
75 – 100%	

If No to all options of 5.1, skip 5.3 and go to 6.1.

5.3 How important were the firm's innovations in procurement, distribution and logistics in realizing the following outcomes?

	Very imp	Imp	Neutral	Not so imp	Irrelevant
Open up new market opportunities					
Improve firm's turnover					
Respond to market pressures					
Respond to cost pressures					
Respond to existing or forthcoming					

6. Business Process Innovation - Administration and Management

6.1 In last three financial years (FY 2017-18, FY 2018-19 and FY 2019-20), did the firm introduce?

	Yes	No
a) New strategic management activities (<i>carried out at the highest managerial levels including the formation, implementation, and evaluation of cross-functional decisions such as new business practices, identifying new investments, acquisitions, and divestments, and setting product strategy, and coordination activities that enable the organization to achieve long-term objectives</i>)		
b) New methods of organizing work responsibilities and decision making		
c) New methods of organizing external relations with other firms or public institutions		
d) New or significantly improved supporting activities for the firm's business processes [<i>such as corporate governance (legal, finance, planning, etc.), maintenance systems or operations for purchasing, accounting, building services, management, and administrative support activities</i>]		

If Yes to a, b, c or d, please briefly describe the type(s) of innovation introduced in administration and management:

6.2 Does the firm have a formal:

	Yes	No
R&D strategy		
Industry 4.0 strategy		

If No to all options of 6.1, skip 6.3 and go to 6.4.

6.3 How important were the firm's innovations in administration and management in realizing the following benefits?:

	Very imp	Imp	Neutral	Not so imp	Irrelevant
Open up new market opportunities					
Improve firm's turnover					
Respond to market pressures					
Respond to cost pressures					
Respond to existing or forthcoming					

6.4 In the context of the COVID-19 pandemic, how was the firm's business resilience affected with respect to:

	Severe impact	High impact	Moderate impact	Minor impact	No impact
Entrepreneurship					
Finances					
Customers					
Supply chains					
Operations					
Manpower					

7. Objectives Of Firm's Innovation Activities

7.1 From FY 2017-18 to FY 2019-20, how important were the following objectives to engage in innovation activities?

	Very imp	Imp	Neutral	Not so imp	Irrelevant
Increase range of goods or services					
Improve quality of goods or services					
Increase capacity for producing goods or services					
Improve the quality of production process					
Replace outdated products or processes					
Increase speed of supplying/delivering goods or services					
Reduce labor costs					
Reduce material and energy costs					
Increase the firm's turnover					
Enter new markets					
Increase existing market share					
Increase visibility in the market					
Allow the firm to keep up with its competitors					
Meet requirements of clients					
Reduce environmental impacts					
Improve health and safety of the firm's employees					
Catering to Corporate Social Responsibility					
Meet regulatory requirements (e.g. standards, etc.)					
Other (please specify): _____					

8. Innovation Activities And Financing

8.1 From FY 2017-18 to FY 2019-20, did the firm engage in the following activities?

	In pursuit of innovation	Regardless of its purpose	No
In-house R&D			
External R&D			
Acquisition of new machinery, equipment and software from India			
Acquisition of new machinery, equipment and software from Abroad			
Software development and database activities			
Acquisition of external knowledge from India			
Acquisition of external knowledge from abroad			

	In pursuit of innovation	Regardless of its purpose	No
Employee training activities			
Marketing and brand equity activities			
Engineering, design and other creative work activities			
IP-related activities			
Innovation management activities			
Other activities (please specify):			

8.2 In FY 2019-20, select value of investment for activities conducted in pursuit of innovation incl. of personnel & related costs (INR Lakhs):

	0	<5	5-20	20-50	50-100	>100
In-house R&D						
External R&D						
Acquisition of new machinery, equipment & software from India						
Acquisition of new machinery, equipment & software from abroad						
Software development and database activities						
Acquisition of external knowledge from India						
Acquisition of external knowledge from abroad						
Employee training activities						
Marketing and brand equity activities						
Engineering, design and other creative work activities						
IP-related activities						
Innovation management activities						
Other activities (please specify):						

8.3 Which of the following sources financed the firm's innovation activities in FY 2019-20?

	Please tick
Retained earnings	
Foreign commercial bank loans	
Local commercial bank loans	
Central Government subsidized loans	
Central Government grants	
Central Government subsidies	
State Government subsidized loans	
State Government grants	
State Government subsidies	
Business angel funds (individuals)	
Venture capital funds (companies)	
Funds from supranational and international organizations (EU, WB, UN, etc.)	
Other (please specify): _____	
None	

9. Sources of Information and Co-Operation For Innovation

9.1 From FY 2017-18 to FY 2019-20, how important were following information sources to the firm's innovation activities?

	Very imp	Imp	Neutral	Not so imp	Irrelevant
Internal (within this firm or firm group)					
Venture Capitals					
Startups					
Business Incubators					
MNCs					
Suppliers of equipment/materials/components/software					
Clients or customers					
Competitors or other firms					
Consultants, commercial labs, or private R&D institutes					
Universities or other higher education institutions					
Government or public research institutes					
Conference, trade fairs, exhibitions					
Scientific journals and trade/ technical publications					
Professional and industry associations					

9.2 From FY 2017-18 to FY 2019-20, as part of its innovation activities, did the firm cooperate with other firms/institutions? the firm's innovation

Formally	
Informally	

9.2.1 If yes to Formally, please specify number of formal cooperation agreements: _____

9.2.2 If yes to Informally, please specify number of informal cooperations: _____

9.3 Please indicate the type of innovation co-operation partner by location

	Within India	Outside India
Venture Capitals		
Startups		
Business Incubators		
MNCs		
Suppliers of equipment, materials, components or software		
Clients or customers		
Competitors or other firms		
Consultants, commercial labs, or private R&D institutes		
Universities or other higher education institutions		
Government agencies		
Public research institutes		
Private research institutes		
Professional and industry associations		

10. Ongoing or Abandoned Innovation Activities

10.1 From FY 2017-18 to FY 2019-20, did the firm have any activities that did not result in any type of innovation defined above because the activities were:

	Yes	No
Abandoned or suspended before completion		
Still ongoing at the end of the 2019		
Abandoned after the activity or project began		
Abandoned in the middle of the activity/project		
Seriously delayed		

11. Factors Hampering Innovation Activities

11.1 From FY 2017-18 to FY 2019-20, were the firm's innovation & innovation activities impacted by the following factors:

	Severe impact	High impact	Moderate Impact	Minor impact	No Impact
Lack of funds within the firm or group					
Lack of finance from sources outside the firm					
Innovation costs too high					
Excessive perceived risks					
Innovation capability (R&D, design, etc.) insufficient					
Lack of qualified personnel					
Lack of information on technology					
Lack of information on markets					
Deficiencies in the availability of external services					
Difficulty in finding cooperation partners					
Organizational rigidities within the firm					
Market dominated by established firms					
Uncertain demand for innovative goods or services					
Lack of infrastructure					
Weakness of intellectual property rights					
Legislation, regulations, standards, taxation					
Low demand for innovations in the market					
No need due to prior innovations by this firm					
No need due to very little competition in firm's market					
Lack of good ideas for innovations					

11.2 Please assess the effect of following legislation/regulations on firm's innovation activities (FY 2017-18 to FY 2019-20)

	Stimulated Innovation	Created no major problems	Created uncertainty	Generated an excessive burden	Lacked consistency across India	Not relevant
Product safety/consumer protection						
Operational and worker safety						
Environmental						
Intellectual property						
Tax (introduction of GST)						
Employment or social affairs						
Other: _____						

Section D: Resources

12. Human Resources

12.1 What is the number of employees in the firm?

	Please tick
0 to 19	
20 to 49	
50 to 199	
≥200	

12.2 What is the composition of the firm's workforce?

	Percentage
Managers	_%
Technical/ supervisory staff	_%
Clerical/ administrative staff	_%
R&D staff	_%
Production and manual workers (shop floor staff)	_%
Other (please specify): _____	_%

12.3 What percentage of the firm's employees had the following highest level of education (in FY 2019-20)?

	Percentage
PhD	_%
Masters	_%
Graduate	_%
High school diploma	_%
All other	%

12.4 In FY 2019-20, did the firm have formal internal or external training programs for its employees?

	Yes	No
Internal training		
External training		

12.5 In FY 2019-20, what were the sources of funding for the firm's formal internal or external training programs?

	Internal	External
Retained earnings		
Foreign commercial bank loans		
Local commercial bank loans		
Central Government subsidized loans		
Central Government grants		
Central Government subsidies		
State Government subsidized loans		
State Government grants		
State Government subsidies		
Business angel funds (individuals)		
Venture capital funds (companies)		
Funds from supranational and international organizations (EU, WB, UN, etc.)		
Other (please specify): _____		
None		

12.6 From FY 2017-18 to FY 2019-20, did the firm employ or engage experts in?

	Yes: employed in-house	Yes: from external sources	Both	No
<u>Industry 4.0</u>				If No to Industry 4.0, skip questions 13.2 & 13.3
Engineering/applied sciences				
Mathematics/statistics/database management				
Design of products				
Software development				
Multimedia				
Web design				
Market research				
Graphic arts/layout/advertising				

12.7 From FY 2017-18 to FY 2019-20, did the firm use any of the following tools to boost innovation among firm's staff

	No	Yes, successful	Yes, but not successful	Yes, but don't know if successful
Brainstorming sessions				
Innovation workshops				
Multidisciplinary or cross-functional teams				
Diversity in recruitment				
Establishment of innovation groups outside routine				
Job rotation of staff to different departments				
Financial incentives for employees to develop new ideas				
Organizational showcasing and recognition for best				
Non-financial incentives for employees to develop new				
Training employees to develop innovative ideas				
Other (please specify):				

13. Infrastructure

13.1 What are the most important infrastructure constraints affecting the firm's growth?

	Please tick all that apply
Transport conditions	
Connectivity (internet, telephone service, etc.)	
Storage facilities (warehousing)	
Electricity (or energy) supply	
Other	

If No to Industry 4.0 in question 12.6, skip questions 13.2 and 13.3 and go to question 14.1.

13.2 From FY 2017-18 to FY 2019-20, did the firm use any of the following Industry 4.0 technology or ICT equipment?

	Hardware	Software
Cloud		
Augmented reality		
Virtual reality		
Autonomous robots		
Machine learning/Artificial Intelligence		
Internet of things (IoT)		
Big data		
Additive manufacturing		
System integration		
Cyber security		
Simulation		
Other (please specify): _____		
None		

13.3 How significant were the following benefits from Industry 4.0 technologies for the firm's growth?

	Very imp	Imp	Neutral	Not so imp	Irrelevant
Open up new market opportunities					
Improve the firm's turnover					
Respond to market pressures					
Respond to cost pressures					
Respond to existing or forthcoming regulatory provisions					

14. Intellectual Property (IP)

14.1 FY 2017-18 to FY 2019-20, which of the following activities did the firm engage in to protect its intellectual property:

	Did not use	Granted/signed	Not granted
Apply for a patent in India			
Apply for a patent outside India			
Register an industrial design			
Register a trademark			
Claim copyright			
Licenses of IP rights from other organizations			
Confidentiality agreements			
Non-disclosure agreements			
Trade secrets			
Other (please specify): _____			

15. MISCELLANEOUS

15.1 How satisfied is the firm with the following innovation enablers?

	High	Medium	Low	Not Relevant
Innovation mindset of employees				
R&D capability of employees				
Innovation mindset of external talent pool				
R&D capability of external talent pool				
Government support enabling innovation				
Innovation infrastructure in your state				
Investment climate in your state				
Ease of doing business in your state				

15.2 In case you have recommendations or suggestions on innovation practices, please list three.



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