



THE ECONOMICS SOCIETY, SRCC



# START UP & INNOVATION INDEX


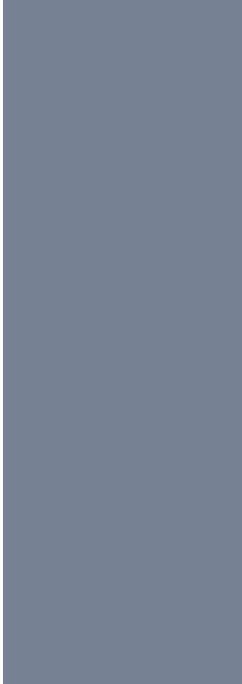




**Dashboard**

**2025-2026**



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**Startup &  
INNOVATION  
Index**

# ABBREVIATIONS

Sl No.	Abbreviation	Expanded Form
1	UT	Union Territory
2	R&D	Research and Development
3	VC	Venture Capital
4	GER	Gross Enrolment Ratio
5	FDI	Foreign Direct Investment
6	Capex	Capital Expenditure
7	AIF	Alternative Investment Fund
8	SLA	Service Level Agreement
9	IPR	Intellectual Property Rights
10	AISHE	All India Survey on Higher Education
11	CGPDTM	Controller General of Patents, Designs and Trade Marks
12	STEM	Science, Technology, Engineering and Mathematics
13	GSDP	Gross State Domestic Product
14	SVEP	Startup Village Entrepreneurship Programme
15	NATS	National Apprenticeship Training Scheme

# INTRODUCTION

Startups and innovation ecosystems play an imperative role as building blocks of modern economies. Startups are young, up-and-coming enterprises with an appetite for risk-taking and exploring dynamic, new ideas that cater to emerging markets and consumer demand, while innovation ecosystems nurture such enterprises by providing support in the form of policies, institutions, finance, infrastructure, etc. In developing nations, such ecosystems become indispensable; not only do they create employment and job opportunities, but they also facilitate the flow of new technology, the creation of emerging markets, especially in the age of climate crisis, where sustainable development and green economic models are essential for humanity. In 2024, global venture capital investment in startups exceeded USD 300 billion, and young innovation-led firms accounted for 30-40% of new technology filings in key sectors, according to the Global VC Investment Trends Report 2025 and World Intellectual Property Indicators 2024. Such startups lead with innovation and create space for such services and value chains, which promote green economic development. In 2024, startups in

clean energy and climate tech attracted nearly USD 90 billion in global investment, reflecting the potential for entrepreneurial innovation in advancing sustainability, according to the Climate Tech Investment Report 2025. A startup-friendly country is adaptive, dynamic and forward-looking, navigating through the uncertainties in the business world with rigour. This interaction between startups and innovation is mutually reinforcing: innovation drives entrepreneurial activity, while startups act as channels through which innovation is commercialised and scaled.

India, one of the fastest-growing economies, hosts the largest population in the world, approximately 1.47 billion. Startups play a pivotal role in actualising its long-term growth prospects and tap into the huge human resource that it boasts. Hence, policies and institutional support need to be carefully designed, targeted, and region-specific to ensure equitable, stable and sustainable growth.

Acknowledging their contribution to the development of a nation, multiple indices and reports have

measured innovation ecosystem development and startup activity; however, they are often based on research over short windows, which fail to take into account the dynamics, shocks and persistence that occur in a business environment. This limits understanding whether the state/country's performance is structural or transitory. Such research is often done on a global level through a systematic approach and provide cross country guidance; however, for large and diverse countries like India, such global aggregates do not provide substance to create policy reforms and support to improve the innovation ecosystem.

This report aims to fill in the gap of existing literature by providing a multi-year analysis, which allows us to distinguish sustained performance from short-lived spikes and enable trend decomposition. Being India-centric, this report focuses on the 30 states and UTs, and critically analyses the regional strengths and weaknesses in order to facilitate targeted policies in a diverse and large economy like India's. Unlike many studies, which focus on input (R&D, intellectual property) and output (startups and unicorns) analysis alone, this report adopts a multi-criteria decision-making methodology, which enables us to truly understand the environmental factors which impact the establishment of new enterprises and

the ease of doing business.

The scope of this dashboard has three dimensions: geographical coverage, temporal coverage, and analytical depth. Geographically, this report is state-based and draws intra-national comparisons on the performance of each state based on its innovation capacity and startup activity through recognising various state policies, institutions, and ecosystem maturity that each state has, its enforcement, and the current statistics. Temporally, the performance of states has been measured over multiple years, broadly from 2014 to 2024, which enables conclusions drawn from trend analysis, identification of consistent and volatile performers on both cluster and standalone bases.

Analytically, such performance has been based on various parameters segregated into defined domains, classified as beneficial and non-beneficial, ensuring the direction of their delta is appropriately accounted. This facilitates an in-depth understanding of the factors within the enterprise and in the environment which directly or indirectly impact performance and future growth. The methodology this report adopts is robust and transparent, where analysis of each state is derived from a multi-criteria decision-making framework over multiple years. This dashboard monitors the progress of each and every state over time and facilitates

pre and post-policy comparisons. The formation of peer groups among states allows cluster-specific policies and helps us to distinguish between high-performing and low-tier states and enforce reforms and policies accordingly. Domain-wise scores and rankings reveal which pillar is weak, enabling targeted policy actions and balanced regional growth. It will allow policymakers to track year-wise rankings and performance of each state, identify potential areas requiring attention, and distinguish between types of performance gaps, then address them accordingly.

# LITERATURE REVIEW

Over the previous decade the global understanding of start up enterprises and the innovation ecosystem has gone through a series of drastic changes, seeing which a growing body of literature has tried to then componentialise and break down the understanding, relevance and impact of such, on tangible aspects of the economy and daily life. In the current academic spread numerous Indian and international organisations have tried to quantify innovative capacity and start up systems using base indices and datasets. These reports provide a foundational understanding of how innovation ecosystems function, how they can be measured, and which parameters are most relevant in identifying high-performing regions.

This Literature Review provides a comparative to the WIPO - Global innovation index, NITI Ayong - India Innovation Index, IP India Annual Reports, Ease of Doing Business Report and AISCHE reports. Yet the contemporary approach of the existing academia, has largely fallen short of duly crediting the importance of start ups and innovation especially in the Indian context, failing on a variety of parameters that are then

thematically organised to ensure a report that supersedes their shortfall.

## Global Innovation Index:

One of the most comprehensive global frameworks developed to assess the innovation performance of an economy has been the Global Innovation Index (GII), issued by WIPO, which evaluates 139 economies using parameters such as global R&D expenditure, innovation clusters, technological progress, scientific output, and socioeconomic impact. The report offers an international benchmark by ranking economies globally and regionally while also identifying innovation over performers.

Additionally, it provides valuable insights into global innovation trends such as the recent slowdown in venture capital funding and stagnation in overall R&D growth despite increasing scientific publications. However, the GI primarily adopts a macro-level approach that compares countries rather than internal sub-national regions. While it provides a strong conceptual base for understanding innovation measurement,

its broad global scope limits its ability to capture micro-level regional disparities, particularly in a country as diverse as India.

Moreover, the report emphasises innovation in general, rather than directly measuring how innovation translates into startup growth, entrepreneurial activity, and ecosystem expansion. This creates a significant gap for studies that aim to analyse innovation through the lens of the startup ecosystem.

### **Intellectual Property Rights India:**

The role of intellectual property generation in determining innovation capacity has been strongly highlighted in the Intellectual Property Rights Report, which analyses the present trends in patents, trademarks, designs, and copyrights filing. This report provides the reader with a detailed breakdown of domestic filing as contrasted with foreign patent registrations and evaluates the financial performance generated through the said IPR filings. Furthermore, it also goes ahead to examine geographical indication (GI) registrations and state-wise trends in an attempt to identify regions with a higher IP generation. These findings are significant as intellectual property is widely accepted as a measurable indicator of innovative output and

technological advancement. However, this existing IPR report tends to treat intellectual property creation as an independent performance indicator rather than a component of a larger entrepreneurial or innovation ecosystem. It does not sufficiently integrate supporting variables such as the availability and distribution of incubators, STEM talent and other educational components, R&D spending, or state-wise startup registration growth.

The report is limited in its attempt to understand and credit the root activities that lead to innovation or development of such capacities which finds an elevated degree of relevance in a developing economy such as India which has a nascent IP presence. Therefore, while an IPR-based study is useful for assessing innovation output, it is incomplete when evaluating startup-driven innovation, which requires broader ecosystem indicators, especially in the Indian context.

### **India Innovation Index:**

A major contribution to innovation measurement within India is the India Innovation Index by NITI Aayog, which analyses and subsequently ranks Indian states and union territories based not only on their innovation outputs such as patents, knowledge diffusion, economic

outcomes but also on their innovation inputs such as institutional environment, human capital, R&D capacity. This report is significant as it shifts the focus from a standardised national-level performance to a detailed state-level innovation capacity, which enables greater context-specific understanding of innovation disparities across India, unlike the WIPO report or other global comparatives that limit such breakdowns to the US, China, Japan and Europe alone.

However, NITI Aayog's index remains broad and institutional in nature, focusing heavily on policy-level indicators to suit policy motives for which it was commissioned, and while it goes forth to rank states and UTs effectively, it does not provide a highly operational understanding of startup growth patterns, such as localised incubation capacity, startup registration intensity, or the distribution of venture funding.

Further, although it captures innovation outputs, it does not specifically examine startup-oriented indicators such as the CAGR growth of startup registrations, FDI inflows per state, women-led startup participation, or GI-based innovation; additionally, it limits itself in its totalistic approach, not accounting for intra-state disparities, which plagues Indian states especially due to the presence of primate cities at that level.

This limits its ability to reflect the on-ground entrepreneurial landscape of India, especially in emerging business enterprise ecosystems and innovative systems in non metro & tier one (MT1) regions. A factor that debars the report further is the lack of period consistency and depth of data, where data comparisons range from a standard 5 or 10 years of depth to as shallow as 3 years. The erraticity of the data periods make the state profiles for parameter comparison incomparable, defeating the presence of such ranking systems in the first place.

After an understanding of the existing literature beyond a prima facie and cursory reading we are provided with a need to develop a framework for assessing innovation performance beyond just contemporary indicators such as intellectual property generation but instead one that undertakes a greater burden to contextualise this emerging sphere for India by including analysis parameters spanning all relevant domains such as Business & Start Up ecosystem, Knowledge and Innovation Capacity, Human & Non human infrastructure readiness & adoption and a statewide performance of innovative factors beyond Metro & Tier 1 (MT1) cities. While Global benchmarks like the WIPO Global Innovation Index and Indian datasets such as AISHE and NITI Aayog's India Innovation Index

offer valuable insights into innovation and education trends, while IPR reports highlight measurable innovation outputs, a key gap remains: most studies rely on macro-level comparisons and broad institutional rankings, failing to capture a micro-level, startup-centric view of India's ecosystem. Indicators such as women-led startups, startup growth per capita, state-wise FDI inflows, availability of incubators and accelerators, STEM infrastructure, and the contribution of tier 2 and tier 3 cities are not sufficiently integrated. To address this gap, the present report develops a more granular state and city-level assessment of India's startup and innovation ecosystem by combining traditional innovation metrics with startup-specific indicators, enabling a clearer understanding of regional entrepreneurial competitiveness and innovation-driven growth.

- Surprisingly, the sheer volume of patent applications filed is actually considered one of the worst indicators of true innovation, carrying a negative correlation score of -0.673.
- While one might expect startup registration growth to signify a booming ecosystem, the data reveal it is a remarkably poor parameter for predicting innovation, showing a steep negative score of -0.729.
- Grassroots empowerment pays off beautifully, as the funds allocated and utilised under the Startup Village Entrepreneurship Programme (SVEP) emerge as a top-tier innovation driver with a solid 0.771 score.

# ANALYTICAL FRAMEWORK

With this report, we have classified the startup and innovation ecosystem into five strategic domains that will assess state-level maturity and performance. This will systemically deconstruct the economic landscape, from the level of entrepreneurial vitality and regulatory efficiency to human capital and infrastructure readiness, which will provide policymakers with a clear picture of specific strengths and structural gaps.

We have used a strict methodology, based on Key Performance Indicators blended from authoritative government sources. For fairness in comparisons between states of vastly different sizes and populations, metrics are normalised per capita and presented as Z-scores. The use of data in this manner allows a very fine resolution analysis of both "pull factors" for investment and the underlying structural elements of inclusive growth.

## A. Business and Start-up Ecosystem

This domain assesses the dynamism of the entrepreneurial environment, as well as the ease of doing business, within the state. It includes indicators

on startup density, regulatory burden, financial health, and the general macroeconomic environment conducive to business survival. The emphasis in this section is on the "pull factors" that attract investment and encourage the establishment of enterprises.

### DPIIT-recognised startups

*Source: OGD*

This is a good barometer of the formalisation and the density of the startup economy at the grassroots level. Higher density implies not just the entrepreneurial intent, but a good signal for state policies' effectiveness in identifying, registering, and bringing startups under the official ambit, thereby making them eligible for tax benefits and public procurement.

### Growth rate of startup registrations

*Source: Sansad PQARS / Data.gov.in*

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into the huge human resource that it boasts. Hence, policies and institutional support need to be carefully designed, targeting and region-specific to ensure equitable, stable and sustainable growth. Acknowledging their contribution to the development of a nation, multiple indices and reports have measured innovation ecosystem.

It reflects the ecosystem's momentum by tracking the CAGR over a medium-term horizon. It tells apart the mature state that has perhaps reached a plateau from the emerging states, which are experiencing rapid acceleration in entrepreneurial activity, and indicates where the next wave of innovation is likely to come from.

### **FDI Inflow by State**

*Source: Sansad PQARS*

Foreign Direct Investment serves as a proxy for the world's confidence in the state's management of economic policy and market opportunity. When normalised by GSDP, it indicates the state's relative appeal to foreign capital, its degree of penetration into the global economy, and its ability to attract the foreign capital investment required for high-growth, capital-intensive industries.

### **Ease of Doing Business**

*Source: RBI Publications / BRAP Report (2015-2020)*

This aggregate score measures the level of business operations friction. This score measures the efficiency of the regulatory environment in terms of speed of obtaining permits, simplicity of regulatory compliance, and transparency of the law. A high score is directly proportional to reduced business costs and a "time-tax" cut for entrepreneurs.

### **State-Wise Collection of GST**

*Source: GST.gov.in (2017)*

GST collection figures provide us with a real-time pulse of consumption patterns in the state. When normalised against GSDP, high rates of GST collection indicate a formalised economy with high commercial exchange, strong consumer buying power, and an effective tax administration system.

### **Gross State Value Added by Economic Activity - Banking and Insurance**

*Source: MoSPI (State Domestic Product)*

The depth of the sector is an important factor concerning the banking and insurance sector. This measurement is used to determine how the financial services sector contributes to the economy. It represents a level of maturity in an economy. A good result in this sector means there is proper liquidity, risk management, and adequate credit.

## State Social Expenditure

Source: RBI, *State Finances: A Study of Budgets*

Even though it appears disparate from business, social expenditure on health, education, and safety nets provides the essential stability for business to thrive in the long run. It is a manifestation of the government's interest in developing human capital, which yields less likelihood of civil unrest and a healthy labour force for the future.

## State-wise capital expenditure

Source: RBI, *State Finances: A Study of Budgets*

Capital expenditure represents the investment of the government in the construction of long-term infrastructure, for example, bridges, power plants, and industrial parks. The implication of elevated CapEx values is a government engaged in the construction of the physical foundation necessary for the future growth of industry.

## Average inflation rate in the state-wise

Source: RBI Publications (2015-)

The stability of inflation is a critical factor for determining the cost of living and the cost of doing business. High inflation levels can lead to a decrease in the purchasing power of consumers, causing wage demands and business operating expenses for

startups to increase. This indicator measures the stability of prices, which is vital for proper business formulation.

## B. Knowledge and Innovation Capacity

This domain involves the assessment of intellectual capital and output. This includes the development and protection of intellectual property, research and development output, and women's contributions to the innovation economy. This sector is vital in measuring the extent to which a nation is evolving from a knowledge economy.

## Women-led startups

Source: *Startup India / DPIIT / PIB*

The indicator measures inclusiveness within the innovation ecosystem. When the ratio of women-led startups to the female population is high, it is an indication that the state is reaping the full benefits of the demographic dividend, leveraging diverse knowledge for problem-solving, and addressing the barriers to female participation in business.

## Application for patents

Source: *CGPDTM Annual Report (DPIIT)*

The key indicator of technical novelty and "hard" innovation is patent filing. The given metric tracks the

transition to a product and IP-based economy from a service-based economy, which reflects the intensity of scientific research and the capability of the state to generate proprietary technology.

### **Applications for Trademarks**

*Source: CGPDTM Annual Report (DPIIT)*

While patents protect inventions, trademarks protect identity. This metric gauges the commercial vibrancy of the state, showing how many new brands are being created and professionalised. It reflects the maturity of marketing by local businesses and their intent to differentiate themselves in the marketplace.

### **Applications relating to Geographical Indicators (GI)**

*Source: CGPDTM Annual Report (DPIIT)*

GI filings indicate the state's capability of monetising heritage and traditional knowledge. That would be critical for any state with a rich cultural history; such protection of unique local products, both agricultural and artisanal, allows such states to position themselves as premium offerings in the global market, bringing value to rural economies.

### **Number of Applications for Designs**

*Source: CGPDTM Annual Report (DPIIT)*

Industrial design is the bridge between functionality and user experience. A high number of design applications indicates a manufacturing sector that is moving up the value chain, focusing not just on utility but on aesthetics and ergonomics, which are critical for competitiveness in consumer goods.

### **State R&D expenditure**

*Source: Open Government Data*

A high score here indicates a high financial input toward innovation and captures the financial input side of the innovation equation. The financial input side of the equation is quantified here in the form of total Government and Private Sector expenditure on Research and Development. High R&D expenditure is a leading indicator of future innovation outputs, reflecting a commitment to scientific progress and technological self-reliance.

### **C. Non-Human Infrastructure Readiness & Adoption**

This domain comprises aspects like the physical as well as digital backbone, which is required for the smooth functioning of any economy. They include aspects like

connectivity (which, for a country, could be rail and road connectivity), digital adoption (e-transactions), and penetration of financial infrastructure.

### **No of E-transactions**

*Source: RBI Dashboard*

The number of digital transactions per capita reflects the level of maturity of the economy. Digital transactions reflect the velocity of money, fintech adoption, and the level of transparency in business dealings. High adoption rates lower the cost of transactions and allow for the easy scaling of businesses.

### **Road Density - Total Road Length**

*Source: RBI Dashboard*

Physical connectivity remains the lifeline of commerce. Road density measures the penetration of the transport network relative to the state's land area. High density implies efficient last-mile connectivity, reduced logistics costs, and easier market access for agricultural and industrial goods produced in remote areas.

### **State-Wise Railway Route**

*Source: Ministry of Railways / PIB*

Rail is a vital tool for heavy freight and mass transit. This indicator focuses on assessing the state's ability to transport bulk raw

materials and large workforces. Well-developed railway infrastructure can reduce the cost of industrial transport and provide a link between the state's industrial centres and national industrial corridors and ports.

### **D. Human Infrastructure Readiness & Adoption**

This domain focuses on the workforce and their education levels, employability, and engagement in the economy. It examines the supply of skilled labour (number of PhDs awarded, Gross Enrollment Ratio), the labour force utilisation (employment in start-ups/MSME employment), and the efficiency of the labour force (unemployment rates and apprenticeship engagement).

### **Employment Generation Through Start-ups**

*Source: DPIIT / Startup India*

This parameter measures the economic viability of the startup ecosystem. Unlike other parameters, this measures not only the number of companies, but also their economic importance in terms of their ability to provide jobs or livelihoods. This parameter also measures the transition from conventional employment to new-age occupations, thereby measuring its capability to employ the workforce in new-age high-growth companies.

of companies, but also their economic importance in terms of their ability to provide jobs or livelihoods. This parameter also measures the transition from conventional employment to new-age occupations, thereby measuring its capability to employ the workforce in new-age high-growth companies.

### **Number of people employed in MSMEs registered on the Udyam portal**

*Source: Udyam Portal (2020-2024)*

The MSME sector is often the largest employer outside of agriculture. This data point tracks the formal employment capacity of small and medium enterprises. High numbers here indicate a robust, labour-intensive industrial base that serves as a critical social stabiliser by providing widespread employment.

### **Number of Apprentices Engaged under National Apprenticeship Training Scheme (NATS)**

*Source: Ministry of Education / MSDE (NATS Data)*

Apprenticeships show the level of industry-academia interaction. High engagement levels imply that local industries are actively contributing to the development of human capital, addressing the issue of the gap between theory and practice.

A high context of apprenticeships points to the availability of "industry-ready" graduates.

### **State-wise enrolment for PhD courses**

*Source: AISHE (Ministry of Education)*

This helps to gauge the depth of the state's high-end talent pool. High levels of PhD researchers are required for sustaining deep-tech startups, pharmaceutical research, and academia. This shows how well the state performs in creating thought leaders and innovators, who are on the cusp of everything new in the world of science.

### **Gross Enrolment Ratio (GER)**

*Source: AISHE (Ministry of Education)*

GER indicates the width of the educational funnel. It measures the general participation of the youth demographic in higher education. A high GER ensures a steady supply of graduates for the workforce, acting as a foundational metric for the availability of trainable human capital.

### **Rural Literacy Rate**

*Source: NSO / MoSPI (PLFS)*

Rural literacy is an important aspect in fostering inclusive growth and plays an essential role in

determining the potential rural workforce's ability to move out of the traditional crop-based economy into value-added occupations or non-farm-based industries. When rural literacy levels are high, as in the case of India, there is less disparity between rural and urban areas. This allows tier-2/3 industries to utilise more available resources.

### **Unemployment Rate State-wise**

*Source: MoSPI*

This is a very important indicator of the efficiency of the labour market.

It is a pointer to the labour supply-demand balance. High levels of unemployment indicate a problem or a weak economy, while low levels show a labour-absorbing economy with potential for wage inflation.

### **E. State Performance Metrics of Innovative Factors beyond Metro & Tier1 (MT1) Cities**

This domain specifically measures aspects of inclusiveness and the level of decentralisation of growth. This measures how well the startup and economic ecosystem is penetrating, specifically focusing on aspects such as rural entrepreneurship, hinterland financial inclusion, and smaller industries.

### **Funds allocated and utilised under Start-up Village Entrepreneurship Programme (SVEP)**

*Source- Ministry of Rural Development / Sansad PQARS*

This metric specifically evaluates government support for micro-enterprises at the village level. It reflects the commitment to alleviating poverty through self-employment and diversifying the rural economy beyond agriculture, ensuring that the benefits of the startup movement reach the grassroots.

### **Market Access and Entrepreneurial Activity (No. of MSME registered)**

*Source: Udyam Portal (2023)*

This is a proxy for economic activities carried out in smaller towns or districts. This measures the penetration of the formal business ecosystem beyond the metro cities and indicates whether the state's economic development is spread across a broad geography.

### **Bank Branches**

*Source: RBI Handbook of Statistics on Indian States (2004-2024)*

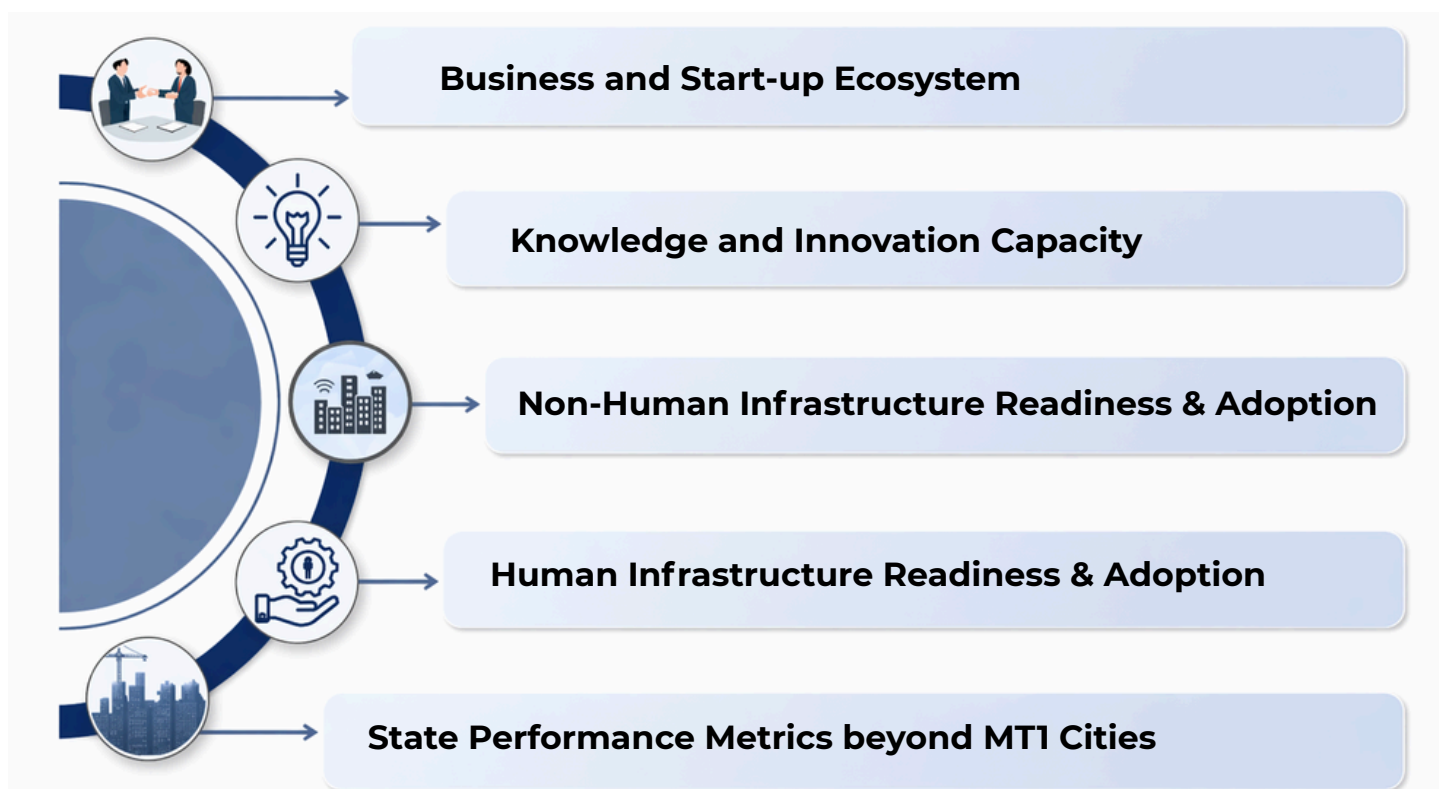
Financial exclusion is one of the significant obstacles hindering rural growth. The density of bank

branches in non-metro locations capture the geographical coverage of the financial system. This captures the ease with which entrepreneurs in non-metro areas can access financial services.

## State-wise Number of Regional Rural Bank (RRB) Branches

Source: RBI (Report on Trend and Progress of Banking in India)

Regional Rural Banks (RRBs) are specialised banking institutions formed to provide support to the unique demands of the rural economy. This indicator measures the availability of bank credit for specific purposes, such as agriculture, rural artisans, and microenterprises, which are not addressed by commercial banks.



# METHODOLOGY

Throughout the writing of this report, we used a rich and multistage statistical approach, one that seeks to overcome the limitations of assessing a wide and varied ecosystem of the economy. Traditional linear ranking approaches are limited in seeking to understand the nuances of innovation since they often presume a linear trajectory of developmental processes and assume the importance of all parameters under consideration.

**Mitigation of Scale Bias:** Leveraging Z-score standardisation to ensure that metrics with high numerical values (such as GSDP) do not adversely affect critical ratios (such as Startups per capita).

**Minimisation of Subjective Bias:** Replacing the weightage system, which is based on expert opinion, with a data-driven system such as MEREC, which determines the importance of each indicator based on the quantified discriminatory power

**Optimisation of Conflicting Criteria:** Utilising MOORA to mathematically combine disparate criteria (such as seeking maximum

growth whilst concurrently seeking minimum volatility) into a summary score.

**Transition from Ordinal to Structural Classification:** Using K-Means Clustering to shift the focus from an absolute hierarchical paradigm to a maturity-based classification, to allow for fair peer-to-peer benchmarking.

## 1. Data Normalisation: Z-Score Standardisation

Considering the heterogeneity of parameters ranging from financial indicators to demographic ratios, any comparison is not statistically valid. To resolve this, Z-score standardisation was carried out.

Process: This method converts raw data into a common unitless scale by calculating the number of standard deviations each data point differs from the mean.

**Formula:**

$$Z_{ij} = \frac{X_{ij}^* - \mu_j}{\sigma_j}$$

- $Z_{ij}$  Standardised score of state  $i$  on indicator
- $X_{ij}^*$  Adjusted raw value
- $\mu_j$  Mean of indicator  $j$  across all states
- $\sigma_j$  Standard deviation of indicator  $j$  across states

## 2. Weighting Technique: MEREC (Method based on the Removal Effects of Criteria)

We employed the MEREC method to use objective weights derived solely from the data structure itself, achieved by examining the perturbation in the system when one of the parameters is removed.

### Step 1: Transformation

Negative values of the Z-scores are transformed to a positive scale to allow for logarithmic calculation.

$$P_{ij} = Z_{ij} - \min(Z_j) + 1$$

**P<sub>ij</sub>** Positive transformed value used in MEREC

**min(Z<sub>j</sub>)** Minimum Z-score among all states for indicator (j)

### Step 2: Overall Performance Calculation

The overall performance of a certain state is determined through a logarithmic calculation of the transformed values.

$$S_i = \sum_{j=1}^m \ln(P_{ij})$$

**S<sub>i</sub>** Overall performance score of state i

**ln** Natural logarithm

**m** Number of indicators

### Step 3: Removal Effect

Performance is recalculated,

excluding the criterion to measure the absolute deviation (impact) caused by its removal.

$$S_i^{(-k)} = \sum_{j \neq k} \ln(P_{ij})$$

**S<sub>i</sub><sup>(-k)</sup>** Score of state i excluding indicator k

$$D_k = \sum_{i=1}^n |S_i - S_i^{(-k)}|$$

**D<sub>k</sub>** Total disturbance caused by removing indicator k

**n** Number of states

### Step 4: Final Objective Weights

Criterion weight is based on its share of the total removal effect, where larger deviations indicate higher discrimination.

$$w_k = \frac{D_k}{\sum_{k=1}^m D_k}$$

**W<sub>k</sub>** Weight of indicator k

## 3. Multi-Criteria Decision Making: MOORA (Multi-Objective Optimisation based on Ratio Analysis)

For the ranking of states, we applied the MOORA method to optimise two conflicting groups of criteria: **Beneficial** (Maximisation) and **Non-Beneficial** (Minimisation).

**Process:** The decision matrix is weighted using MEREC outputs to calculate a final assessment value by summing weighted beneficial scores

and subtracting weighted non-beneficial scores.

**Formula:**

$$V_{ij} = w_j Z_{ij}$$

$V_{ij}$  Weighted normalised value

$$Y_i = \sum_{j \in B} V_{ij} - \sum_{j \in C} V_{ij}$$

$Y_i$  Final composite score of state  $i$

$B$  Set of beneficial indicators

$C$  Set of non-beneficial indicators

#### 4. Year-Wise Rankings

The MOORA technique was applied independently to the dataset for each year within the study period (10 years).

**Significance:** Generating distinct ranking tables for every fiscal year facilitates the observation of short-term volatility and policy impact lags, preventing the obscuration of recent trends found in pre-aggregated datasets.

#### 5. Aggregate 10-Year Assessment (Average Matrix)

To derive a stable, long-term performance index, we constructed an Average Matrix.

**Formula:**

$$\bar{Y}_i = \frac{1}{T} \sum_{t=1}^T Y_{i,t}$$

$\bar{Y}_i$  Structural long-term score of state  $i$

$T$  Number of years

**Rationale:** Averaging performance over a decade mitigates temporal anomalies (e.g., singular FDI spikes), resulting in a "Structural Rank" that represents fundamental ecosystem strength.

#### 6. Cluster Comparison: K-Means Clustering

Moving beyond linear rankings, we employed K-Means Clustering to group states based on structural similarity.

**Process:** The algorithm partitions states into 3 distinct clusters, minimising within-cluster variance whilst maximising between-cluster variance.

$$\min \sum_{k=1}^K \sum_{x_i \in C_k} \|x_i - \mu_k\|^2$$

$K$  Number of clusters (3)

$x_i$  Feature vector of state  $i$

$C_k$  Cluster  $k$

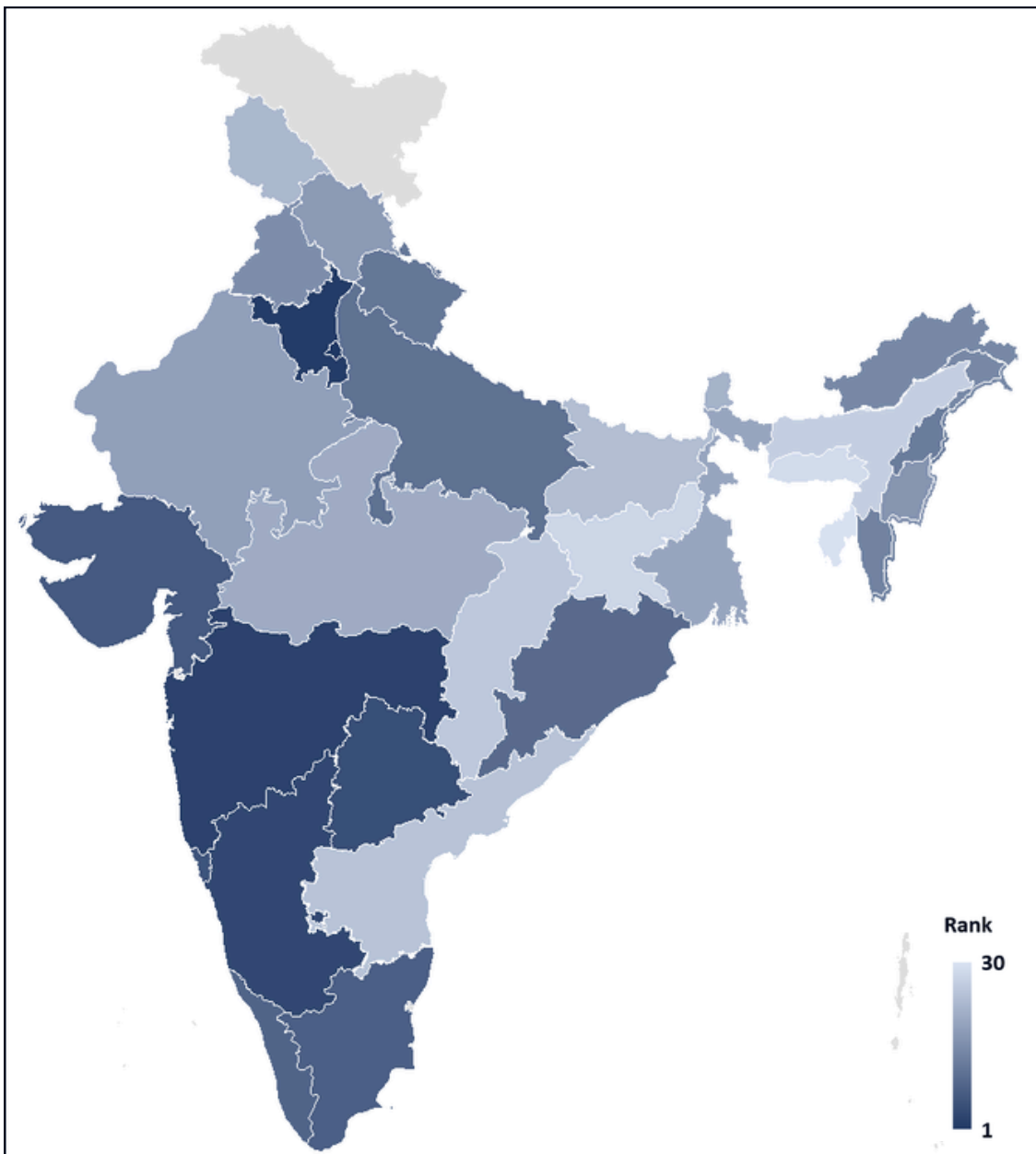
$\mu_k$  Centroid of cluster  $k$

# RESULTS & ANALYSIS

The application of the methodology yields two types of results: state rankings and performance-based cluster formations. Multi-objective optimisation based on ratio analysis was performed using

weights derived from the MEREK application, providing state rankings of India over the past 10 years and final ranks based on sustained performance distinguished from short-lived spikes.

### Final State Ranks Heatmap



## State Ranks Through Years

STATES	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Andhra Pradesh	9	29	26	19	15	24	19	20	16	19
Arunachal Pradesh	3	1	3	7	17	16	13	13	17	8
Assam	24	22	23	27	27	26	23	25	26	25
Bihar	17	12	19	20	18	18	25	24	21	26
Chhattisgarh	19	26	22	23	20	23	29	29	27	27
Delhi	1	3	1	1	1	1	1	1	1	1
Goa	18	20	16	12	12	11	11	8	7	6
Gujarat	14	23	18	14	9	10	10	9	11	11
Haryana	22	19	20	8	10	12	12	12	8	12
Himachal Pradesh	20	15	17	18	21	21	20	17	19	18
Jammu and Kashmir	23	11	12	25	28	29	27	28	24	23
Jharkhand	25	30	27	26	25	27	22	27	28	30
Karnataka	4	7	6	3	5	3	5	7	9	7
Kerala	15	10	11	11	7	5	9	10	10	9
Madhya Pradesh	8	13	15	21	23	25	24	26	22	24
Maharashtra	12	14	8	4	2	2	3	2	2	2
Manipur	16	18	28	24	22	17	15	16	20	21
Meghalaya	28	28	14	28	26	22	28	30	30	28
Mizoram	7	2	2	13	8	9	8	11	4	10
Nagaland	30	27	29	29	29	28	26	21	25	20
Odisha	13	17	13	10	14	8	7	6	13	13
Punjab	11	6	9	9	11	13	14	14	14	15
Rajasthan	21	24	24	17	16	20	18	18	18	16
Sikkim	27	16	25	22	24	14	21	22	23	22
Tamil Nadu	5	8	4	6	6	4	4	4	5	4
Telangana	6	5	5	2	4	6	2	3	3	3
Tripura	29	25	30	30	30	30	30	23	29	29
Uttar Pradesh	2	4	7	5	3	7	6	5	6	5
Uttarakhand	10	9	10	16	19	19	16	15	12	14
West Bengal	26	21	21	15	13	15	17	19	15	17

## K-Means Clustering

### 3-Cluster Analysis

<b>CLUSTER 1</b>	Andhra Pradesh
	Bihar
	Chhattisgarh
	Gujarat
	Haryana
	Himachal Pradesh
	Jharkhand
	Karnataka
	Kerala
	Madhya Pradesh
	Maharashtra
	Odisha
	Punjab
	Rajasthan
	Tamil Nadu
	Telangana
	Uttar Pradesh
West Bengal	

<b>CLUSTER 2</b>	Arunachal Pradesh
	Assam
	Goa
	Jammu and Kashmir
	Manipur
	Meghalaya
	Mizoram
	Nagaland
	Tripura
	Uttarakhand
<b>CLUSTER 3</b>	Delhi

#### Cluster 1: Mainstream Performers

The cluster centre values are close to 0.0 across most variables, which represents:

- Near-average characteristics
- Balanced profile without extreme highs or lows
- Forms the ideal Indian state startup ecosystem

Average distance to cluster centre is 2.5-3.5 units, and high variation within the cluster masks any internal differentiation.

#### Cluster 2: Developing Ecosystems

The cluster centre values are predominantly negative across most variables, which indicates:

- Below-average performance across all major parameters
- Profile at a consistent disadvantage

The cluster includes all Northeastern states, along with the Himalayan states and Goa, which is an outlier within the cluster (distance to the centre: 3.793).

The average distance to the cluster centre is 2.5-7.1 units.

### Cluster 3: National Outlier

The cluster centre values are extremely positive, and the distance from the cluster centre is 0.000, a perfect fit to its own centre because Delhi is the only member.

Interpretation:

- 2-5 standard deviations above national mean on critical parameters
- No other state is similar enough to cluster with Delhi
- It is not simply more advanced, but is qualitatively a different ecosystem

## 4-Cluster Analysis

Key Change is that Cluster 2, consisting of 12 states, is split into: 7 Northeastern or developing states (Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Meghalaya, Mizoram, Nagaland) and 3 severely lagging states (Tripura, Uttarakhand, Manipur),

The main impact is the separation of moderately developing states from severely lagging ones, while Delhi remain a singleton cluster.

## 5-Cluster Analysis

The analysis results in over-clustering of states and creates three singleton

clusters: Delhi, Odisha and Mizoram; while Cluster 2 becomes too large, consisting of 20 states, and heterogeneous. It thus becomes difficult to draw useful interpretations, as singleton clusters don't represent meaningful groups - they're just outliers.

Thus, we conclude that the most suitable for analysis and policy formation is the 3-cluster analysis. The 4-cluster analysis can be used as an alternative if separation of severely lagging states is important for policy.

## Critical Focus Areas

### The Commercialisation Chasm

Analysis reveals that India fails to actualise the returns from R&D expenditure into real commercial output. While it generates significant academic outputs like PhDs and patents, it fails to translate them into commercial enterprises and startups. States like Uttar Pradesh show strong rural banking but lack patent applications and MSME registrations. Mizoram has a high PhD enrollment rate, but scores negatively in patents and startup employment. Hence, the multiplier effect is zero.

NITI Aayog's national strategy on artificial intelligence also highlights that India's research-to-commercialisation conversion rate is less than 5% compared to 20-30% in developed economies.

Thus, the bottleneck is institutional and not intellectual.

### Regulatory Delays & Bureaucratic Bottlenecks

In India, finding a startup is easier than sustaining it. Despite having high startup registrations, the regulatory and bureaucratic systems do not support sustenance, but increase their burn rates and cause premature failure. Haryana, despite having a positive startup growth rate, scores negatively in ease of doing business. Administrative restraints directly correlate with failure rates. While digital licensing portals exist, they trigger un-digitised secondary verification steps and procedures, which negate the intended increase in efficiency.

The World Bank's World Development Report also demonstrates that digital portals alone cannot resolve this issue without statutory, time-bound delivery mandates and automatic approval mechanisms.

### Spatial Concentration

Delhi has emerged as an established hub for startups, which operates at 2-5 standard deviations above other states across all domains. This system is fragile because policy changes in Delhi can affect the entire innovation and startup ecosystem, and leave less than 10% of venture capital for 97% of

India's geography. It may also result in permanent brain drain from secondary regions towards Delhi.

OECD venture capital allocation report shows that market-driven capital naturally polarises towards established hubs. Thus, targeted policy actions and reforms are necessary to ensure geographic diversification rather than depending solely on market forces.

### Geographic and Infrastructure Constraints

Cluster 2 states face structural disadvantages due to their mountainous terrain, geographic isolation, and low population density, which leads to high logistics costs, limited land for manufacturing facilities and a limited consumer base for local businesses. Despite these constraints, they demonstrated significant human capital through high scores in PhD enrollment, rural literacy, and academic talent.

Thus, even though strong human capital exists, it is unable to translate into economic opportunity due to structural constraints.



# STATE PROFILES

*State wise analysis presented through visual graphs*

# Rank 1 DELHI



## OVERVIEW

POPULATION  
21 million



GSDP  
USD 133 billion



URBANISATION RATE  
97.5%



## KEY PERFORMANCE INDICATORS

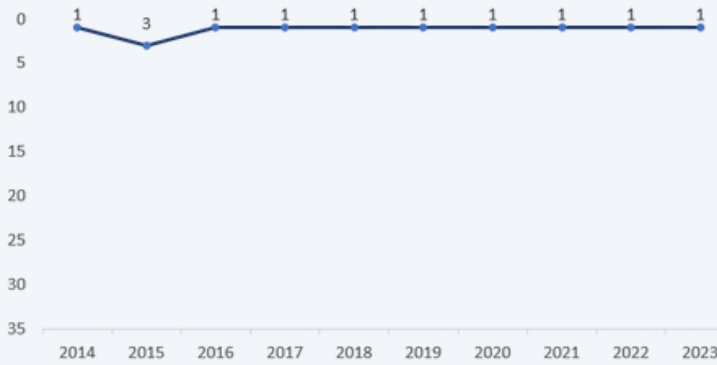
Peer-Group Rank



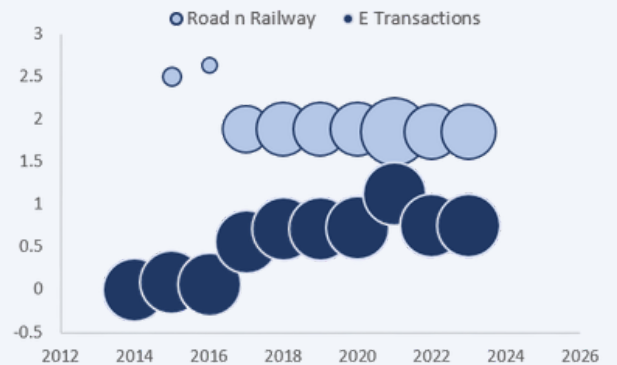
Up-trending Score

▲ +0.038  
Index units per year

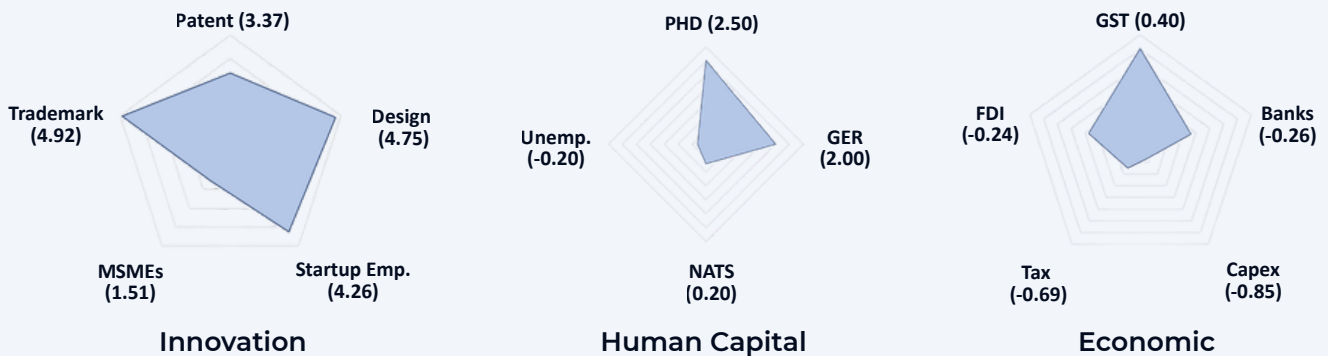
## RANKING TREND



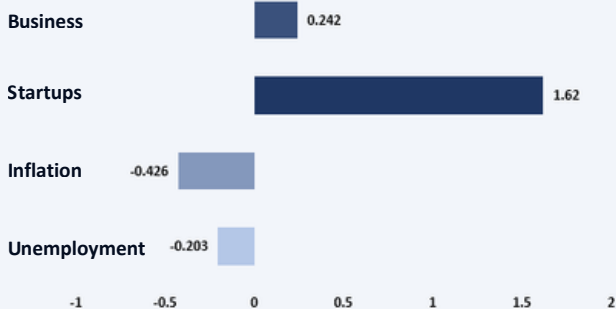
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS



## KEY INFERENCES

- Sustained leadership:** Delhi consistently ranks 1st with steady improvement, showing a mature and stable startup ecosystem.
- Strong innovation activity:** High performance in patents, trademarks, and startup employment indicates a vibrant, IP-driven startup landscape.
- Underlying structural gaps:** Weakness in FDI, capex, and financial indicators suggests economic and infrastructure constraints despite strong innovation output.

# Rank 2 HARYANA



## OVERVIEW

POPULATION  
**30 million**



GSDP  
**USD 134 billion**

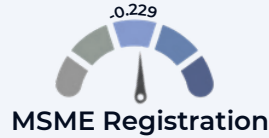


URBANISATION RATE  
**34.9%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank



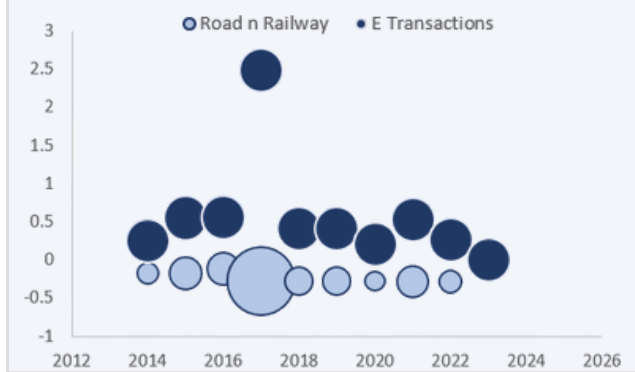
Up-trending Score

**+0.063**  
Index units per year

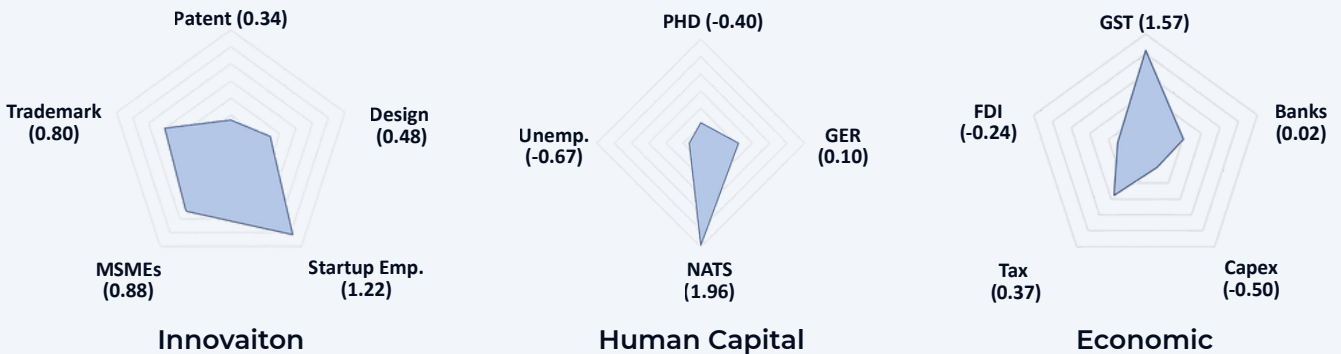
## RANKING TREND



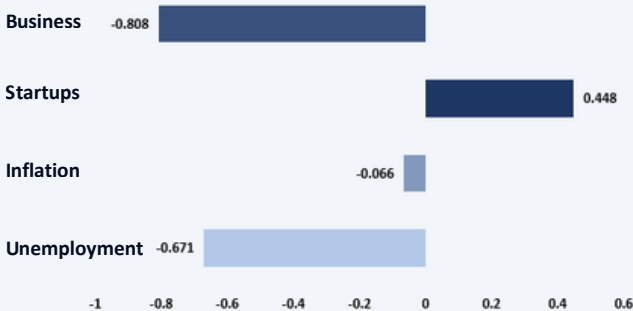
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS



## KEY INFERENCES

- Strong upward trajectory:** Haryana has significantly improved its rank over time, showing rapid ecosystem development, supported by a high positive trend score (+0.063).
- Balanced yet moderate innovation performance:** Innovation indicators are positive but not particularly high, indicating a growing yet still maturing startup ecosystem.
- Mixed economic & human capital signals:** Strong GST and NATS performance contrasts with weaker FDI and capex, suggesting policy and skill gaps that are limiting higher-value innovation growth.

# Rank 3

# MAHARASHTRA.



## OVERVIEW

POPULATION  
**128 million**



GSDP  
**USD 512 billion**



URBANISATION RATE  
**45.2 %**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank



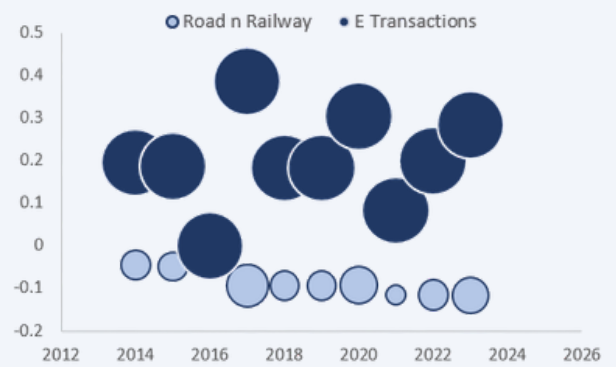
Up-trending Score

**+0.060**  
Index units per year

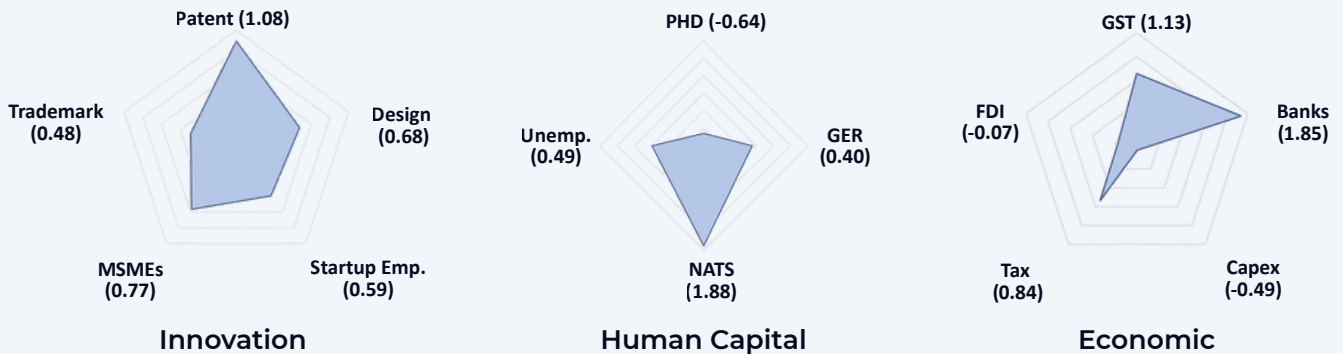
## RANKING TREND



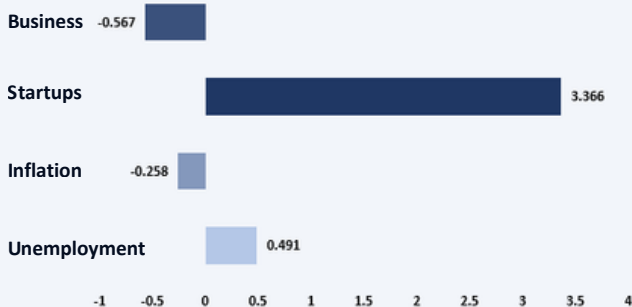
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



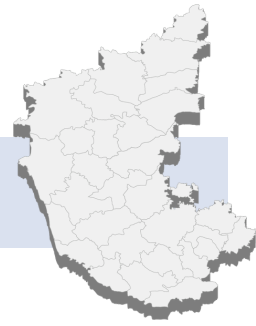
## GAP ANALYSIS



## KEY INFERENCES

- Strong and stable top-tier performer:** Maharashtra has consistently improved and maintained a top 3 position with a positive growth trend (+0.060).
- High innovation and growth momentum:** Strong patent performance and high CAGR indicate rapid expansion of the startup and innovation ecosystem.
- Economic strength with selective gaps:** Strong banking and GST support growth, but weaker FDI and capex point to investment and infrastructure constraints.

# Rank 4 KARNATAKA



## OVERVIEW

POPULATION  
**68 million**



GSDP  
**USD 337 billion**



URBANISATION RATE  
**38.7%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank



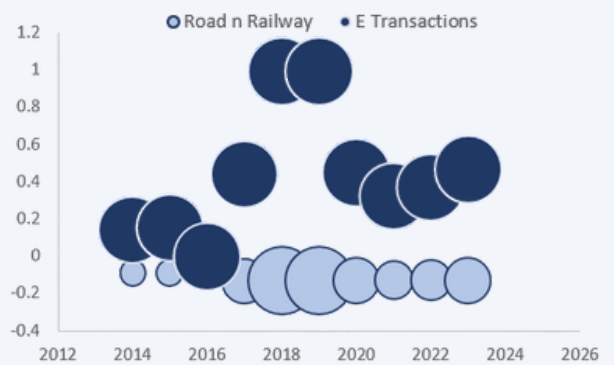
Up-trending Score

**+0.061**  
Index units per year

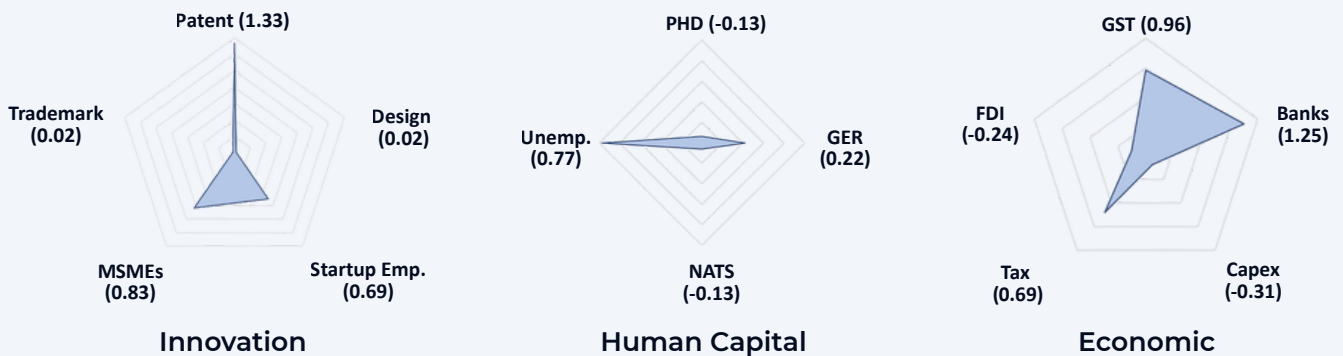
## RANKING TREND



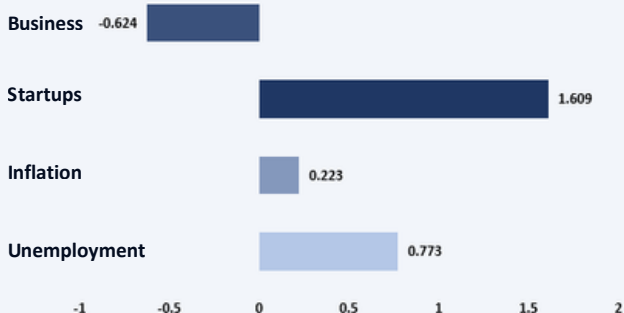
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS

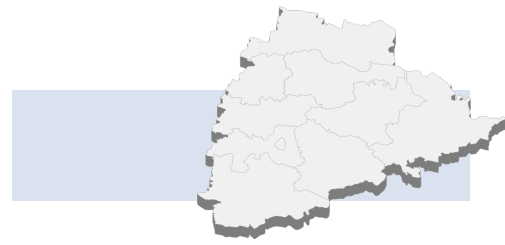


## KEY INFERENCES

- Stable top-tier position with slight fluctuations:** Karnataka remains a top 5 performer, though rankings show some variability in recent years despite a positive trend (+0.061).
- Innovation led by strong patent output:** High patent score (~1.33) highlights a strong research and innovation base, though other innovation indicators (trademarks, design) are relatively moderate.
- Balanced economy with investment gaps:** Strong GST and banking indicators support growth, but weaker FDI and capex suggest constraints in external investment and infrastructure expansion.

# Rank 5

# TELANGANA



## OVERVIEW

POPULATION  
**38 million**



GSDP  
**USD 182 billion**



URBANISATION RATE  
**38.9%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank



PhD Enrollment



Last mile Connectivity

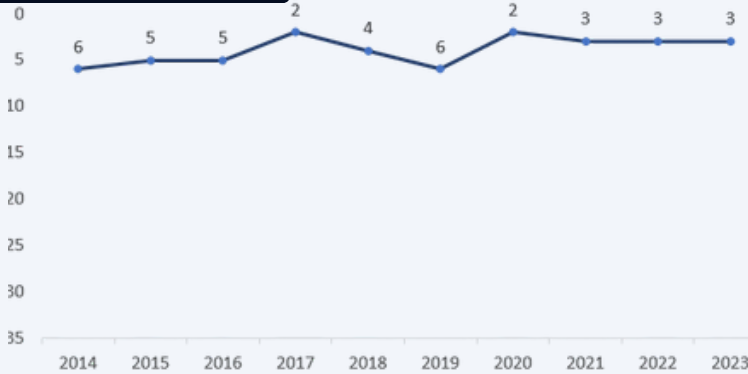


E-Transactions

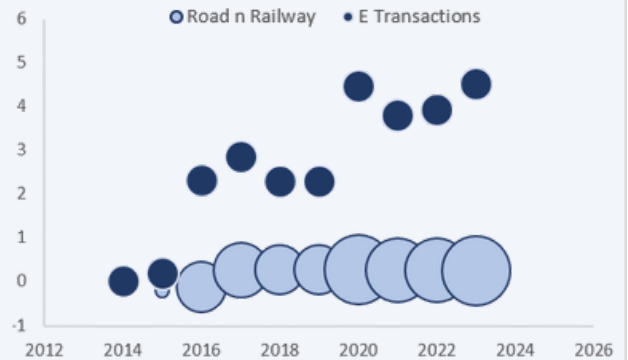
Up-trending Score

**+0.052**  
Index units per year

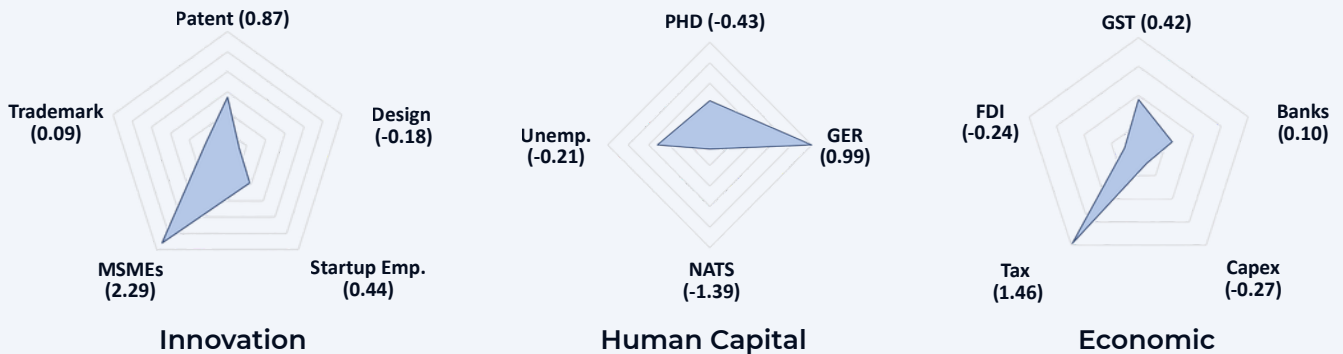
## RANKING TREND



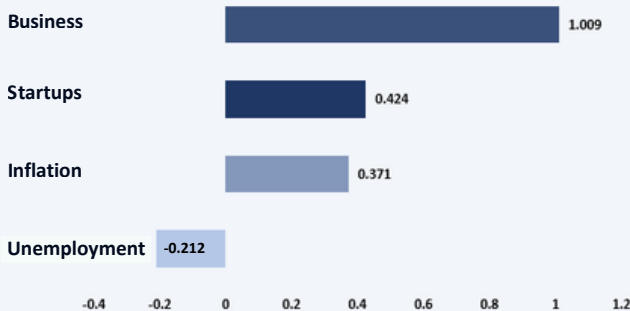
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS



## KEY INFERENCES

- Consistent top-5 performer:** Telangana maintains a stable rank within the top 5 with a positive growth trend (+0.052), indicating steady ecosystem development.
- Moderate but uneven innovation performance:** While patents and business growth show strength, weaker scores in MSMEs, trademarks suggest gaps in broad-based innovation activity.
- Mixed economic and human capital indicators:** Strong capex and PhD enrollment contrast with weaker GST, banking, and GER, pointing to imbalances in economic depth and skill development.

# Rank 6 GOA



## OVERVIEW

POPULATION  
**1.6 million**



GSDP  
**USD 12 billion**



URBANISATION RATE  
**62.2%**



## KEY PERFORMANCE INDICATORS

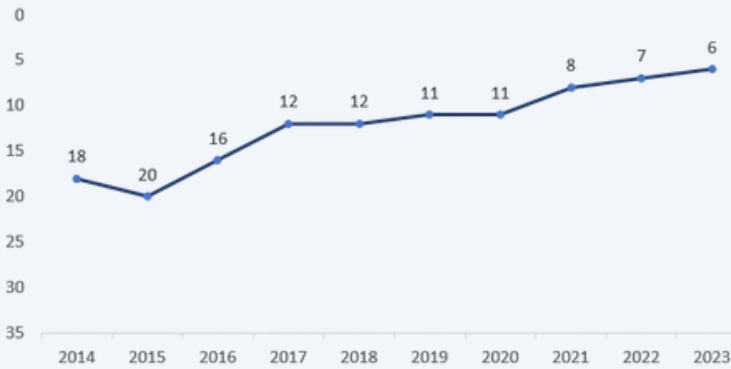
Peer-Group Rank



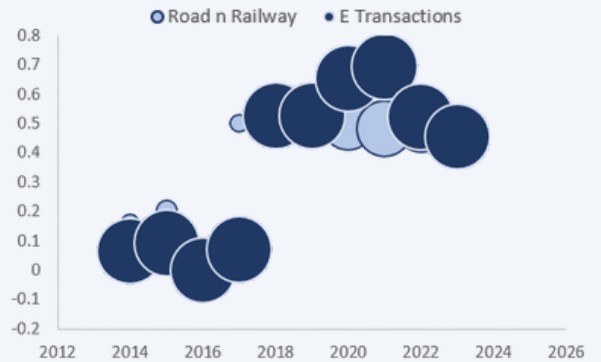
Up-trending Score

**+0.036**  
Index units per year

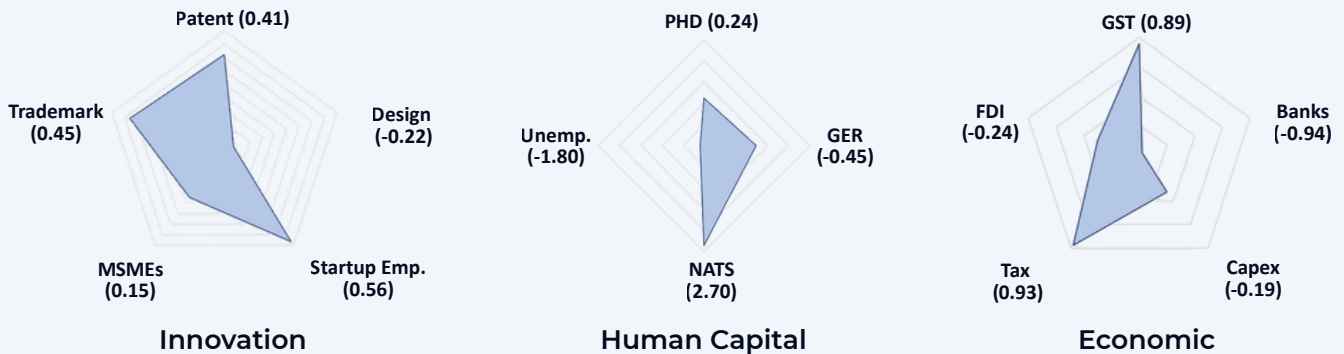
## RANKING TREND



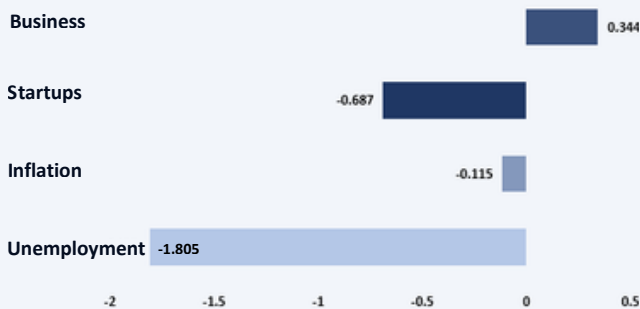
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



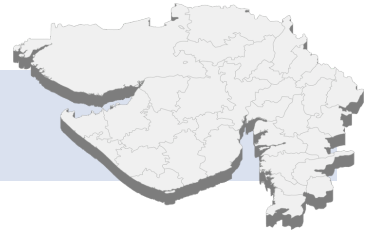
## GAP ANALYSIS



## KEY INFERENCES

- Strong upward trajectory:** Goa has improved significantly in rankings over time, moving from lower positions to the top 10, supported by a positive trend (+0.036).
- Niche innovation performance:** Moderate gains in patents and business indicators suggest a growing but small-scale innovation ecosystem, with limited breadth across indicators.
- Mixed economic and structural base:** High GST performance stands out, but weaker banking, FDI, and overall scale constraints indicate limitations due to size and investment depth.

# Rank 7 GUJARAT



## OVERVIEW

POPULATION  
**73 million**



GSDP  
**USD 334 billion**



URBANISATION RATE  
**42.6%**



## KEY PERFORMANCE INDICATORS

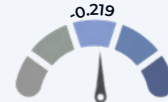
Peer-Group Rank

1

3



GER



Cap Expenditure



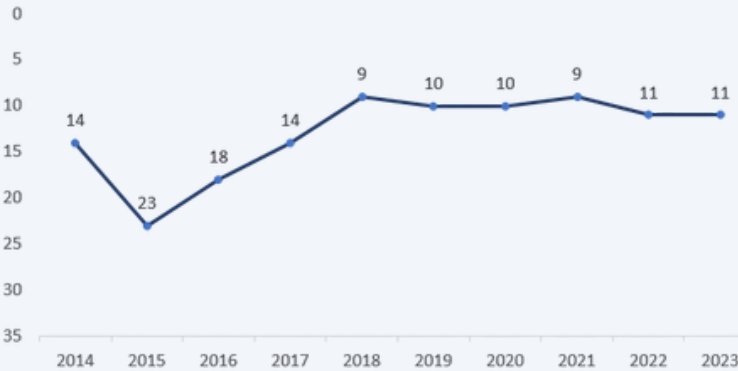
Startups

Up-trending Score

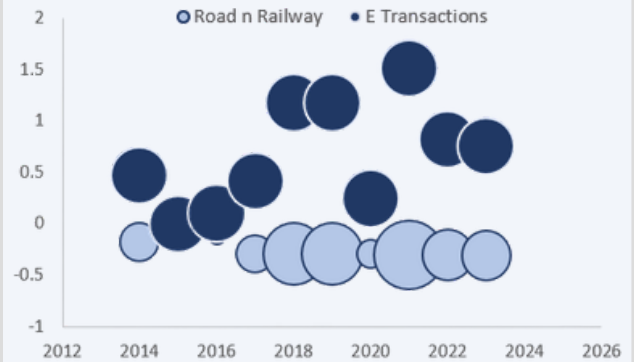
**+0.084**

Index units per year

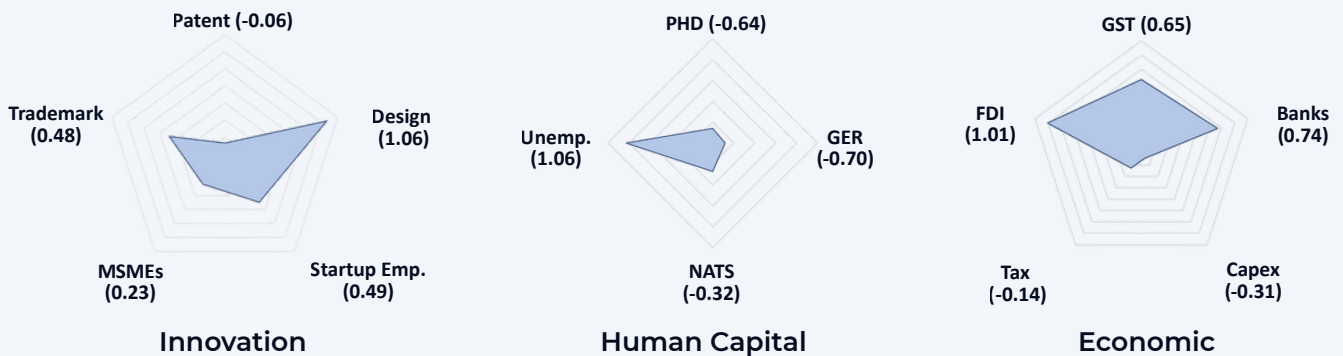
## RANKING TREND



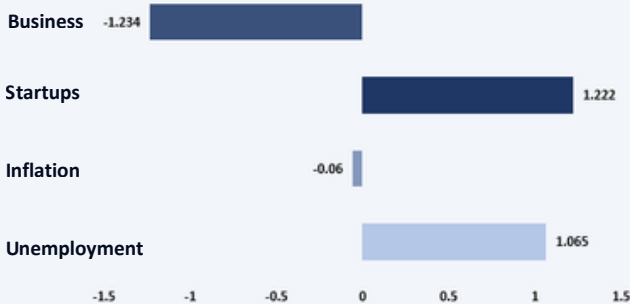
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS

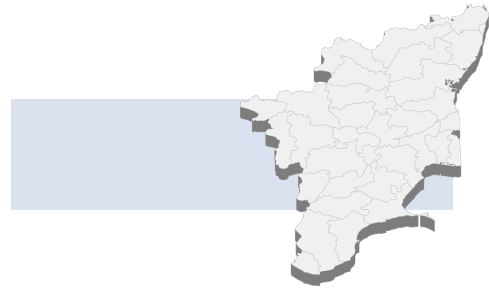


## KEY INFERENCES

- Rapid improvement with strong momentum:** Gujarat shows a clear upward trend in rankings (peaking into the top 10) with the highest positive trend score (+0.084), indicating fast ecosystem growth.
- Moderate innovation with gaps in depth:** While startup activity and design are improving, weaker patent and MSME-related indicators suggest limited depth in high-value innovation output.
- Strong economic base but uneven distribution:** Solid GST and capex performance support growth, but FDI and banking indicators point to imbalances in investment inflows and financial ecosystem strength.

# Rank 8

# TAMIL NADU



## OVERVIEW

POPULATION  
**77 million**



GSDP  
**USD 378 billion**

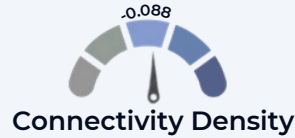


URBANISATION RATE  
**48.4%**



## KEY PERFORMANCE INDICATORS

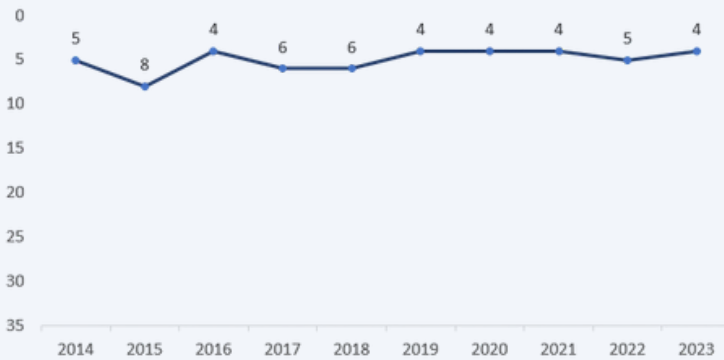
Peer-Group Rank



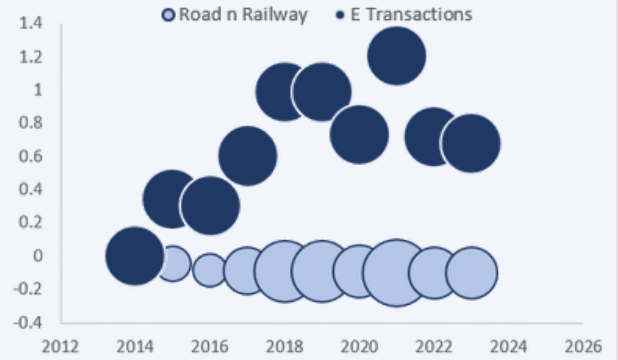
Up-trending Score

**+0.050**  
Index units per year

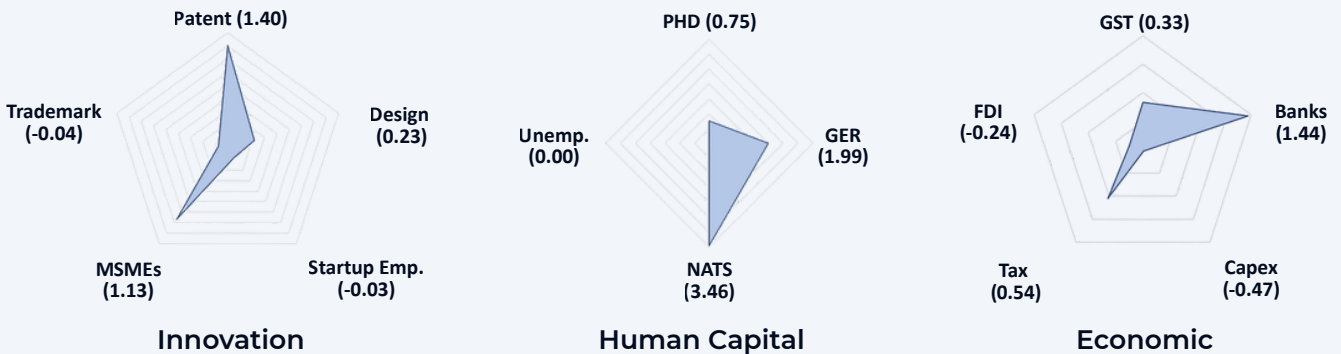
## RANKING TREND



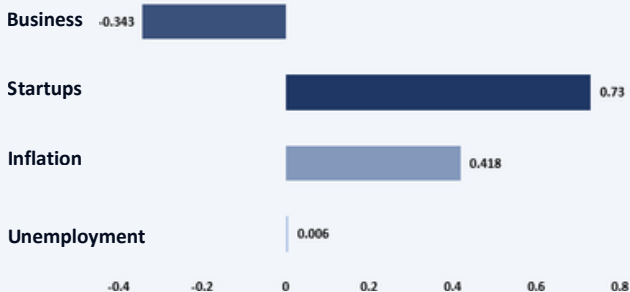
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS



## KEY INFERENCES

- Consistent Top-Tier Stability:** Tamil Nadu has maintained a top 4–8 ranking throughout the decade, supported by a steady positive trend (+0.050), reflecting a mature ecosystem.
- Research-Driven Innovation:** Strong patent output (1.40) and NATS score (3.46) highlight a deep technical talent base powering innovation activity.
- Investment Constraints Persist:** Despite strong human capital and banking scores, weak FDI (-0.24) and capex (-0.47) continue to limit infrastructure expansion and external investment inflows.

# Rank 9 KERALA



## OVERVIEW

POPULATION  
**36 million**



GSDP  
**USD 135 billion**

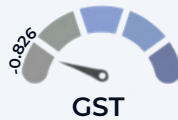


URBANISATION RATE  
**47.7%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank



GST



Inflation



E-Transaction

Up-trending Score

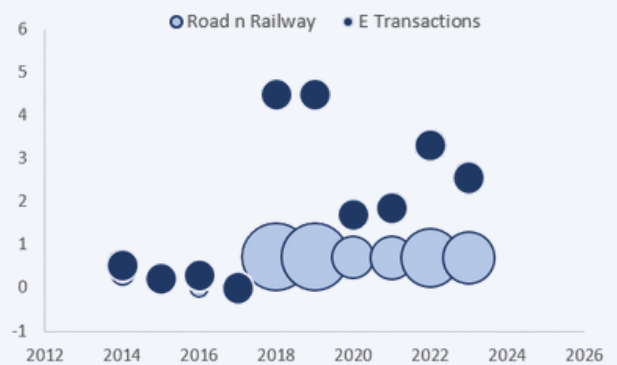
**+0.052**

Index units per year

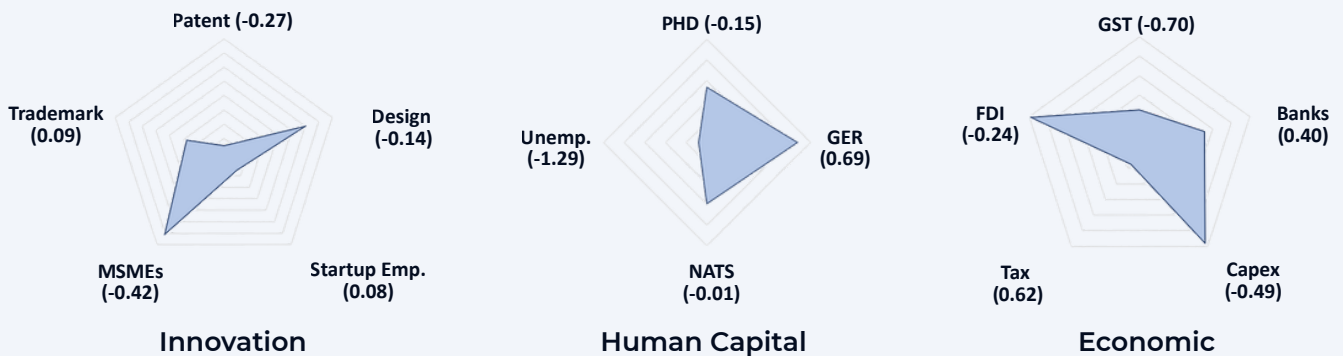
## RANKING TREND



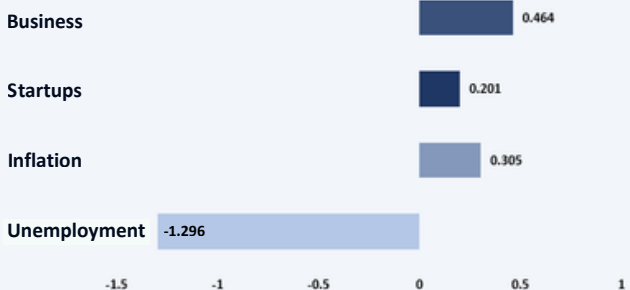
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



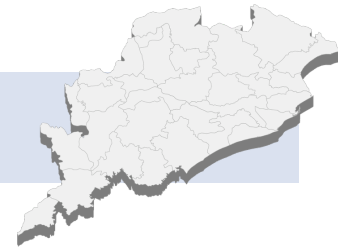
## GAP ANALYSIS



## KEY INFERENCES

- Steady Upward Climb:** Kerala has improved from rank 15 in 2014 to rank 9 in 2023, with a positive trend score (+0.052) reflecting consistent ecosystem development.
- Education-Led Human Capital:** Strong GER (0.69) and banking (0.40) reflect a well-educated, service-oriented economy, though patent and MSME scores remain weak.
- Structural Economic Stress:** Negative GST (-0.70), poor capex (-0.49), and high unemployment (-1.29) signal underlying fiscal pressures limiting productive startup absorption.

# Rank 10 ODISHA



## OVERVIEW

POPULATION  
**47 million**



GSDP  
**USD 103 billion**

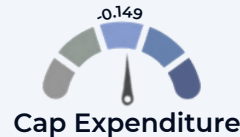


URBANISATION RATE  
**16.7%**



## KEY PERFORMANCE INDICATORS

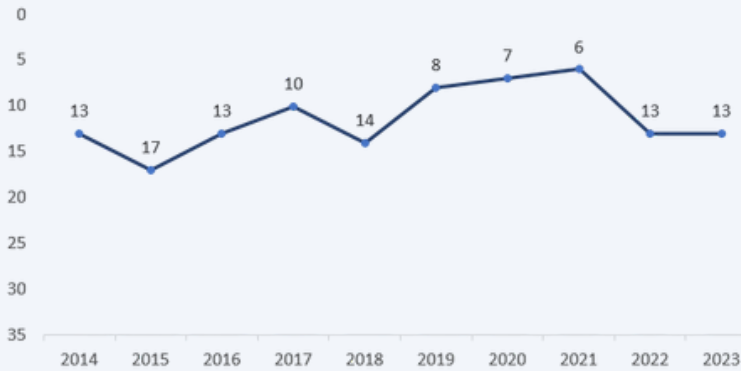
Peer-Group Rank



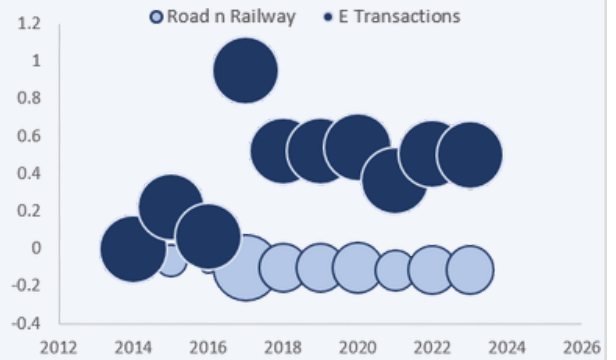
Up-trending Score

**+0.066**  
Index units per year

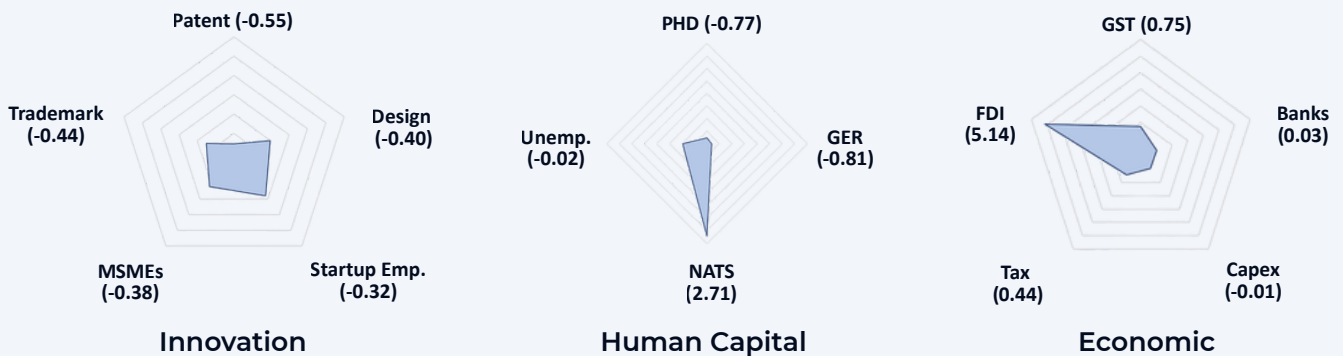
## RANKING TREND



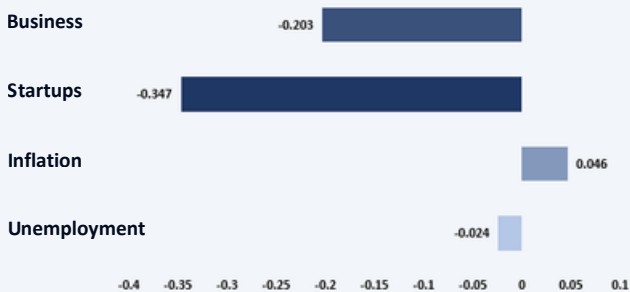
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS



## KEY INFERENCES

- Dramatic Rank Improvement:** Odisha has risen from rank 17 in 2014 to rank 10 in 2023, with a strong positive trend (+0.066) driven largely by surging FDI inflows.
- FDI-Led Economic Foundation:** An exceptionally high FDI score (5.14) and strong NATS (2.71) reflect robust industrial investment forming a solid economic base.
- Nascent Innovation Layer:** Consistently negative patents (-0.55), trademarks (-0.44), and PhD enrollment (-0.77) reveal that the innovation ecosystem remains underdeveloped.

# Rank 11 UTTAR P.



## OVERVIEW

POPULATION  
**240 million**



GSDP  
**USD 300 billion**



URBANISATION RATE  
**22.3%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank

1

4



GER



Cap Expenditure



Rural Banking

Up-trending Score

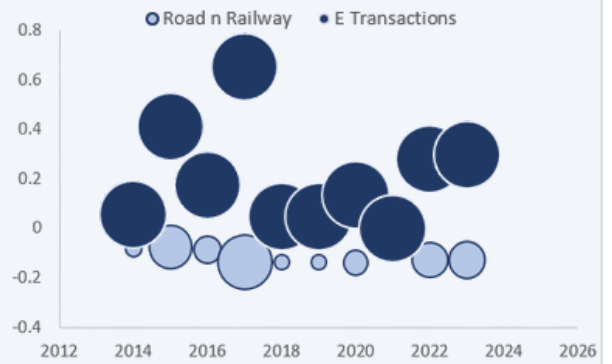
**+0.094**

Index units per year

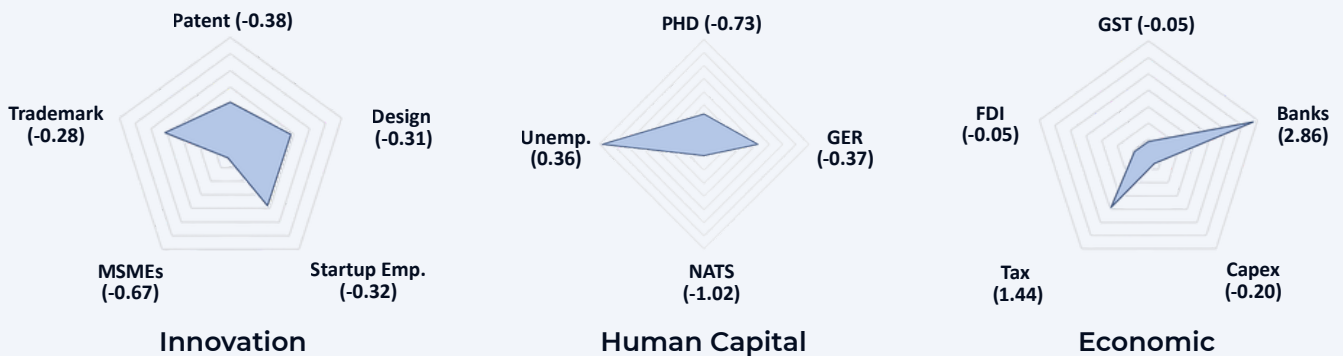
## RANKING TREND



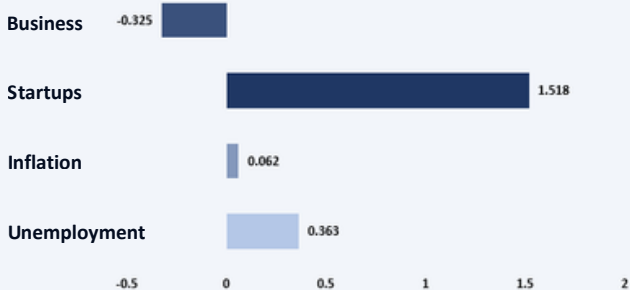
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS

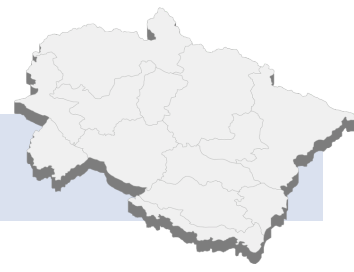


## KEY INFERENCES

- Fastest-Improving Large State:** With the highest trending score in its peer group (+0.094), UP demonstrates remarkable ecosystem momentum driven by large-scale policy enablement.
- Banking Infrastructure as a Growth Driver:** Exceptionally strong rural banking (2.86) and tax performance (1.44) provide a broad financial backbone supporting grassroots entrepreneurship.
- Innovation and Skill Gaps Remain:** Deeply negative patents (-0.38), MSMEs (-0.67), and PhD enrollment (-0.73) highlight a critical lag between economic enablement and high-value innovation output.

# Rank 12

# UTTARAKH.



## OVERVIEW

POPULATION  
**12 million**



GSDP  
**USD 42 billion**



URBANISATION RATE  
**30.2%**



## KEY PERFORMANCE INDICATORS

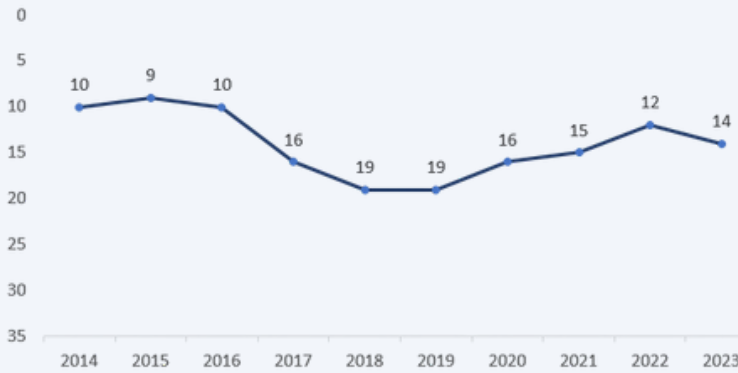
Peer-Group Rank



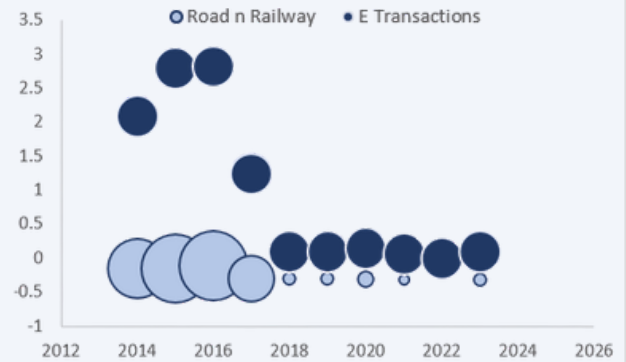
Up-trending Score

**+0.060**  
Index units per year

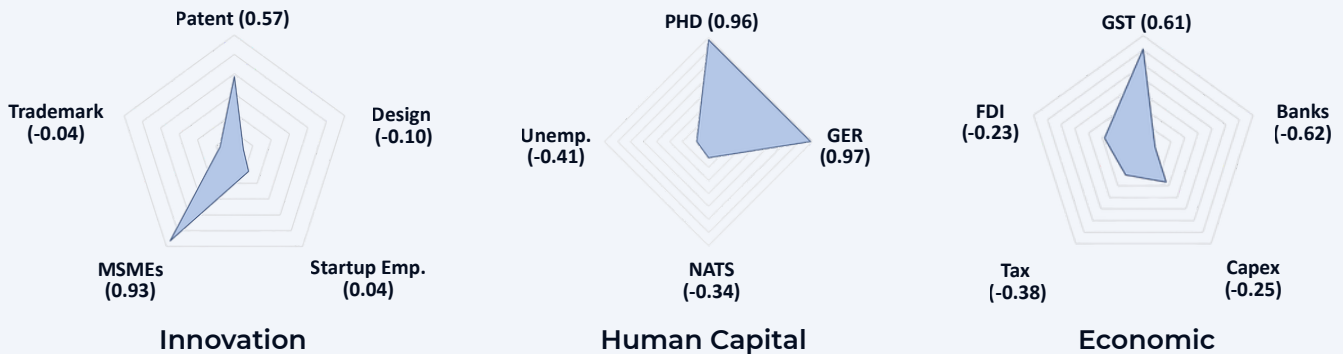
## RANKING TREND



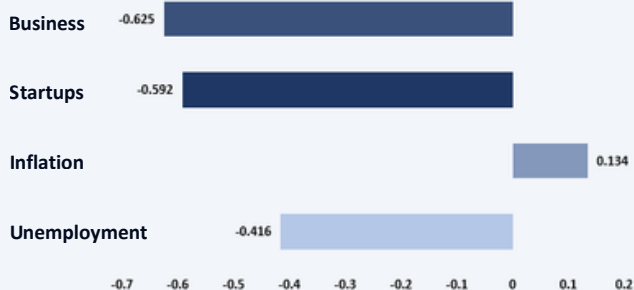
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



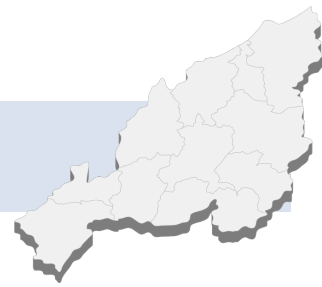
## GAP ANALYSIS



## KEY INFERENCES

- Recovering from Mid-Decade Decline:** After dropping to rank 19 by 2019, Uttarakhand has recovered to rank 12 in 2023, with a positive trend (+0.060) indicating renewed momentum.
- Research-Oriented Human Capital:** Above-average PhD enrollment (0.96), GER (0.97), and patents (0.57) indicate a growing talent base capable of supporting innovation-led growth.
- Business Infrastructure Lags Behind:** Weak banking (-0.62), negative CAGR, and poor startup employment suggest human capital strengths are not yet translating into scalable business creation.

# Rank 13 NAGALAND



## OVERVIEW

POPULATION  
**2.3 million**



GSDP  
**USD 4.2 billion**

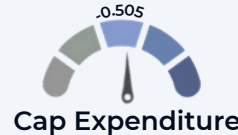


URBANISATION RATE  
**28.9%**



## KEY PERFORMANCE INDICATORS

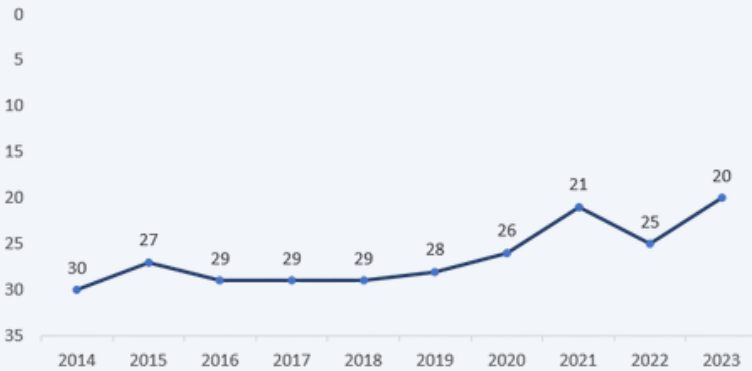
Peer-Group Rank



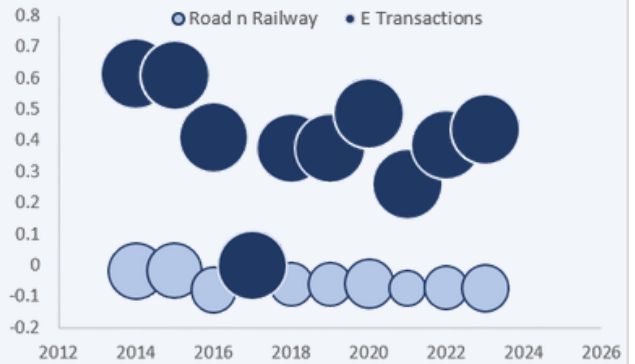
Down-trending Score

**-0.042**  
Index units per year

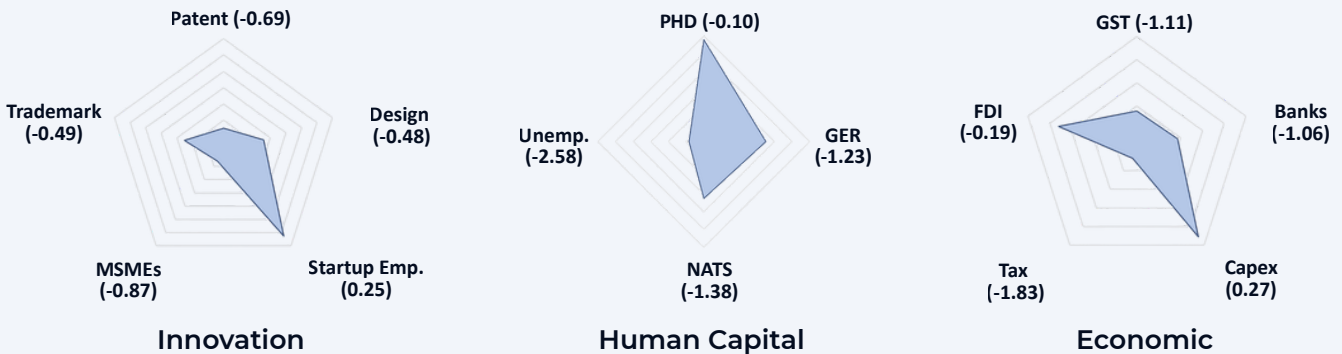
## RANKING TREND



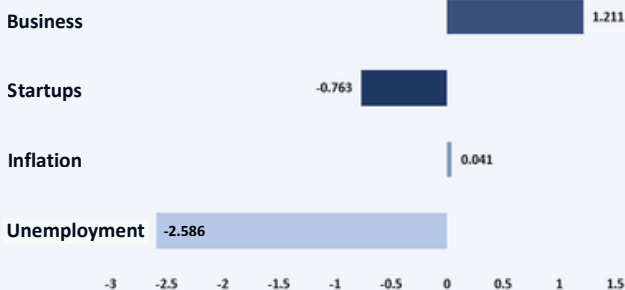
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS



## KEY INFERENCES

- Partial Recovery with Fading Momentum:** Nagaland improved from rank 30 to rank 20 between 2019 and 2023, but a negative trending score (-0.042) signals this recovery may be unsustainable.
- Uniformly Weak Innovation Activity:** Negative scores across patents (-0.69), MSMEs (-0.87), and trademarks (-0.49) reflect an extremely nascent ecosystem with minimal private sector engagement.
- Severe Economic Constraints:** Critical deficits in tax (-1.83), unemployment (-2.58), and banking (-1.06) reflect deep structural challenges constraining any startup ecosystem development.

# Rank 14 MIZORAM



## OVERVIEW

POPULATION  
**1.3 million**



GSDP  
**USD 3.7 billion**



URBANISATION RATE  
**52.1%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank

1

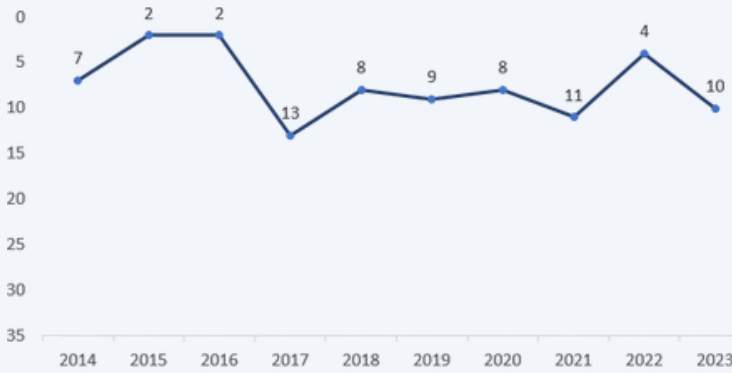
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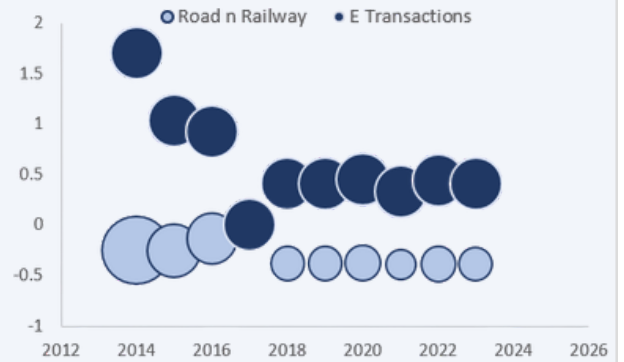
Down-trending Score

**▼ -0.036**  
Index units per year

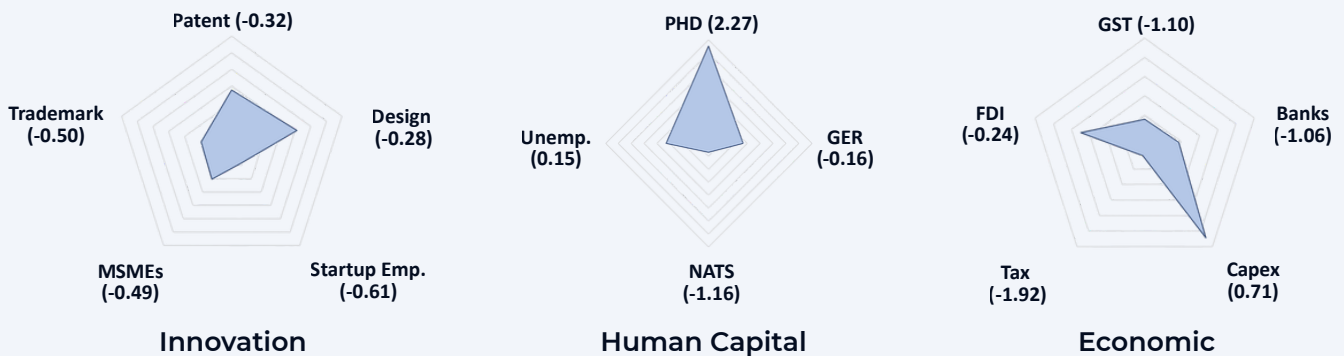
## RANKING TREND



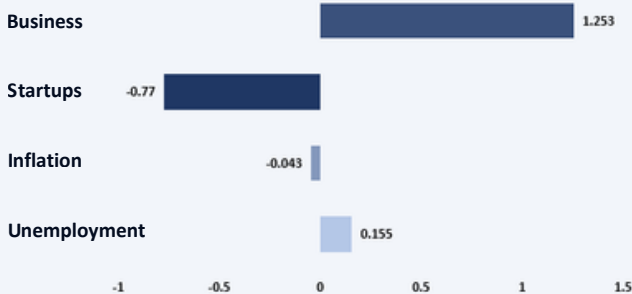
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS



## KEY INFERENCES

- Early Leader Losing Ground:** Mizoram ranked 2nd in 2014 but has declined to rank 14 by 2023, with a negative trending score (-0.036) confirming sustained erosion of its early advantage.
- PhD Enrollment as a Distinctive Strength:** An exceptionally high PhD score (2.27) stands out, though it has not translated into patents, MSMEs, or commercial innovation activity.
- Fiscal and Economic Fragility:** Severely negative tax (-1.92), GST (-1.10), and banking (-1.06) highlight deep fiscal dependence and an underdeveloped private economic base.

# Rank 15

# ARUNACHAL P.



## OVERVIEW

POPULATION  
**1.6 million**



GSDP  
**USD 4.6 billion**



URBANISATION RATE  
**22.7%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank

1



8



Inflation



MSME Reg.



Cap Expenditure

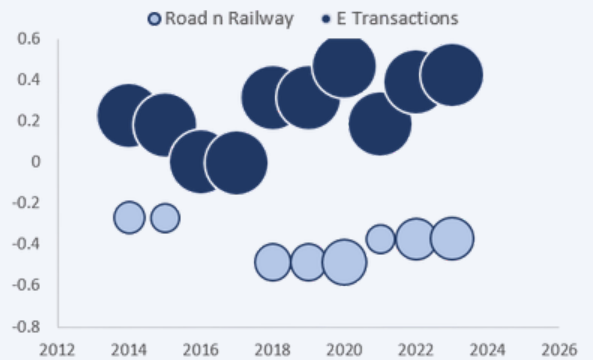
Down-trending Score

**-0.024**  
Index units per year

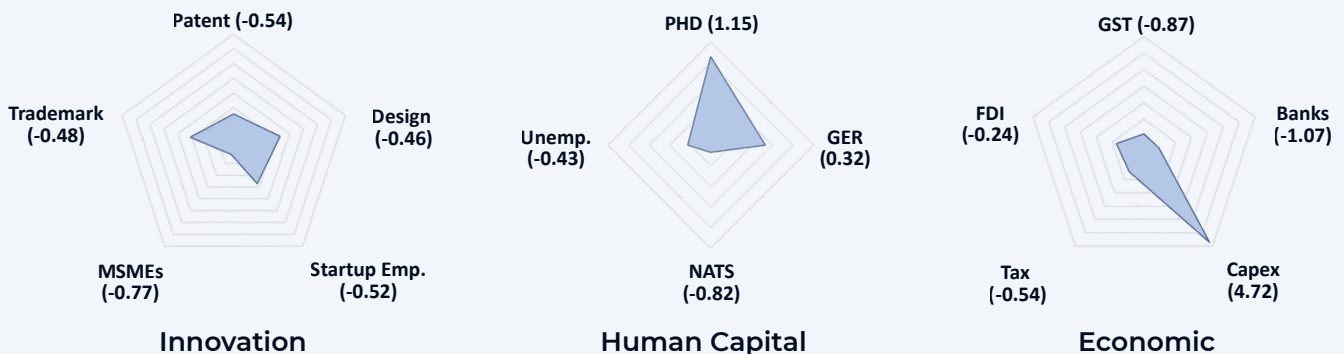
## RANKING TREND



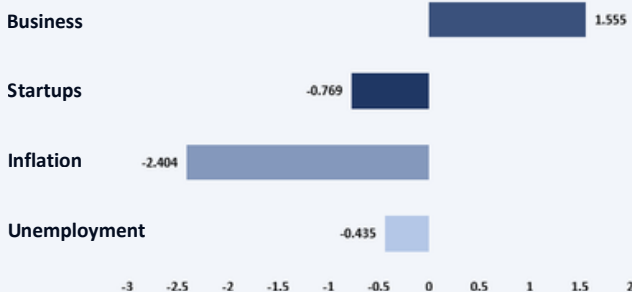
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



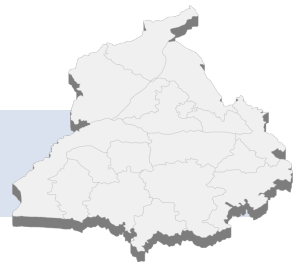
## GAP ANALYSIS



## KEY INFERENCES

- Ranking Volatility:** Arunachal Pradesh has experienced significant fluctuations in its ranking trend, reaching the peak in 2015 before declining by 2018 and recovering slightly in 2023.
- Sectoral Strengths:** Radar analysis shows strong performance in PhD enrollment (0.44) within the Human Capital domain and Capital Expenditure (0.35) in the Economic domain.
- Critical Gaps:** Severe performance gaps can be identified in MSME registration (-0.92), Patents (-0.67), and Banking infrastructure (-1.02), indicating a need for structural business support.

# Rank 16 PUNJAB



## OVERVIEW

POPULATION  
**31 million**



GSDP  
**USD 88 billion**



URBANISATION RATE  
**37.5%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank



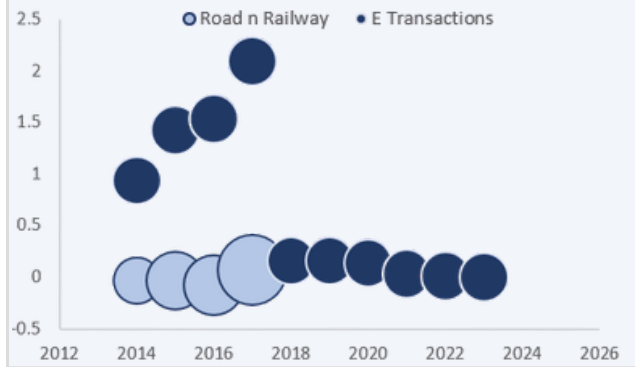
Up-trending Score

**+0.020**  
Index units per year

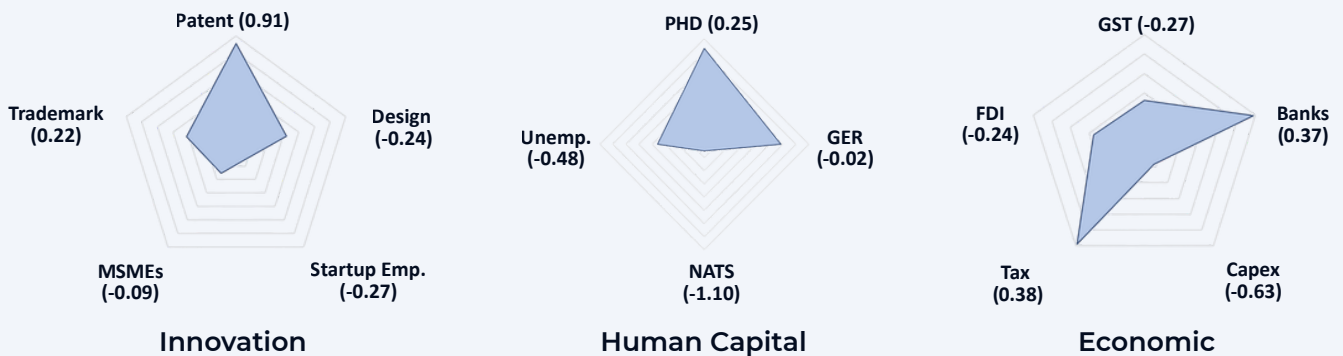
## RANKING TREND



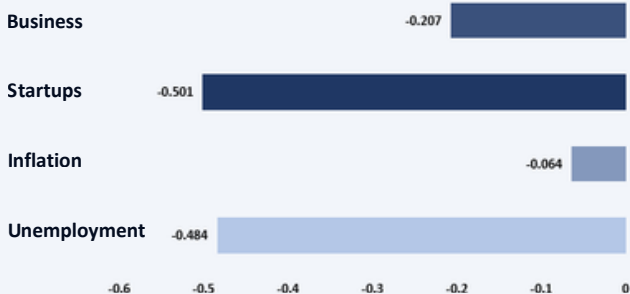
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS



## KEY INFERENCES

- Relative Stability:** The national ranking has remained relatively consistent in the mid-tier, fluctuating only since 2017.
- Economic Momentum:** Exhibits a positive trending score (+0.020) and leads its peer group in Capital Expenditure (0.582) and bank branch density.
- Innovation Deficit:** Gap analysis reveals underperformance in Patent filings and Business pillars compared to regional benchmarks.

# Rank 17 MANIPUR



## OVERVIEW

POPULATION  
**3.2 million**



GSDP  
**USD 4.3 billion**

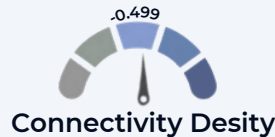


URBANISATION RATE  
**29.2%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank



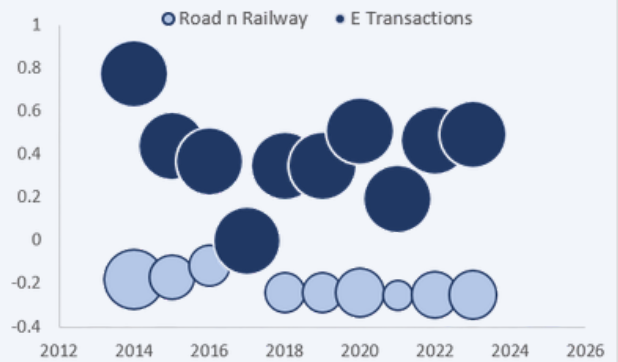
Down-trending Score

**-0.012**  
Index units per year

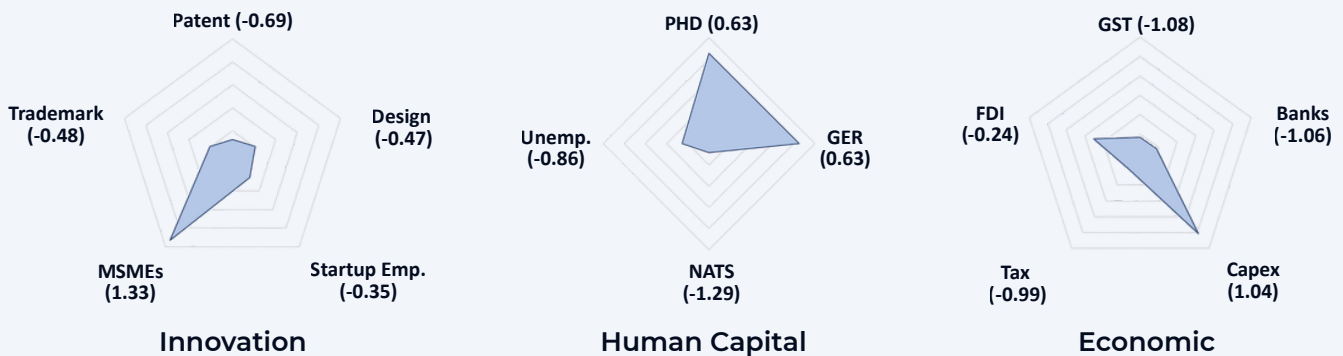
## RANKING TREND



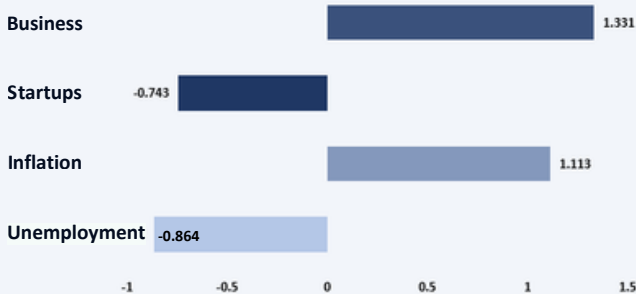
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS



## KEY INFERENCES

- Declining Momentum:** The state has a negative down-trending score (-0.012), with its national rank dropping from 16 in 2014 to 21 by 2023.
- Human Capital Lead:** Similar to other NE states, it shows comparative strength in PhD enrollment (0.44) but faces high unemployment (0.36) pressures.
- Physical Infrastructure:** Gap analysis highlights Business and Patents as major developmental hurdles despite stable road and railway connectivity.

Rank 18

# HIMACHAL P.



## OVERVIEW

POPULATION  
7.5 million



GSDP  
USD 25 billion



URBANISATION RATE  
10%



## KEY PERFORMANCE INDICATORS

Peer-Group Rank



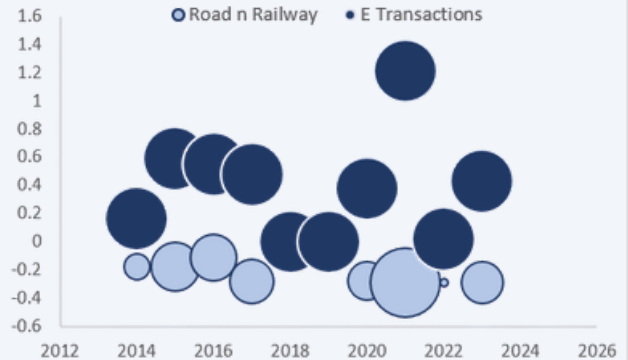
Up-trending Score

▲ +0.041  
Index units per year

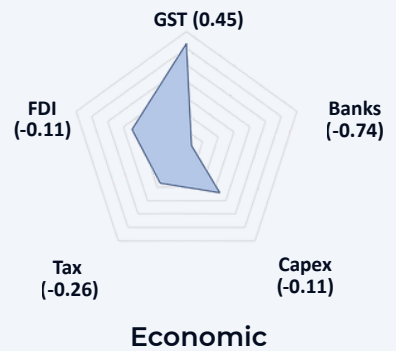
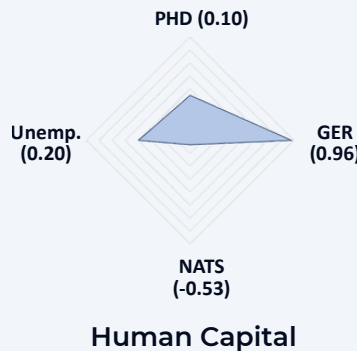
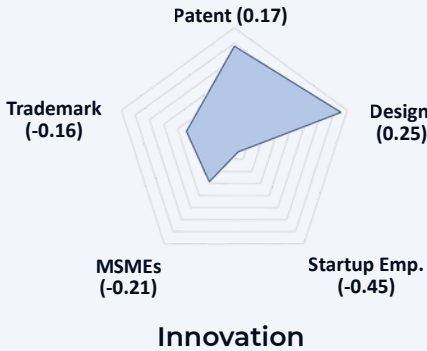
## RANKING TREND



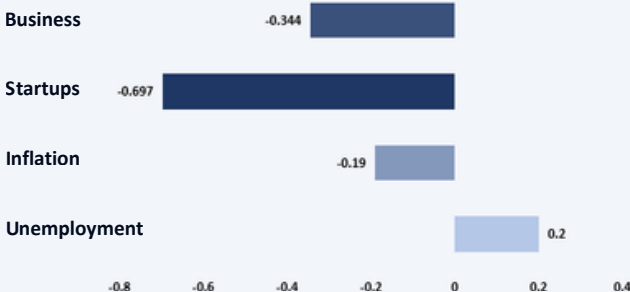
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS



## KEY INFERENCES

- Positive Trajectory:** Maintains a healthy upward-trending score (+0.041), with a 2023 national rank of 18.
- Digital Adoption:** Bubble analysis shows a high volume of E-transactions relative to physical infrastructure, indicating a strong shift toward a digital economy.
- Pillar Inconsistencies:** While the state performs well in PhD enrollment (0.44), it suffers from significant gaps in Patent filings (-0.67) and MSME registration (-0.92).

# Rank 19

# RAJASTHAN



## OVERVIEW

POPULATION  
**81 million**



GSDP  
**USD 183 billion**



URBANISATION RATE  
**24.9%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank

1



6



Connectivity Density



PhD Enrollment



Rural Banks

Up-trending Score

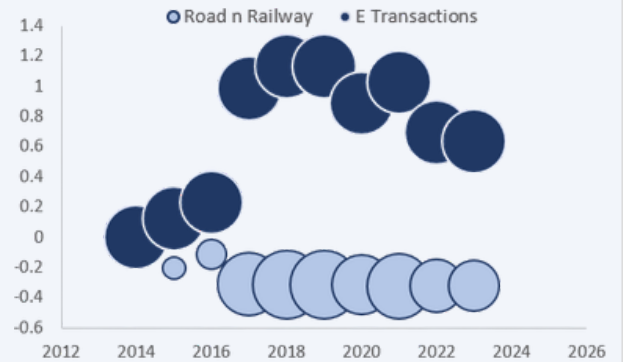
**+0.056**

Index units per year

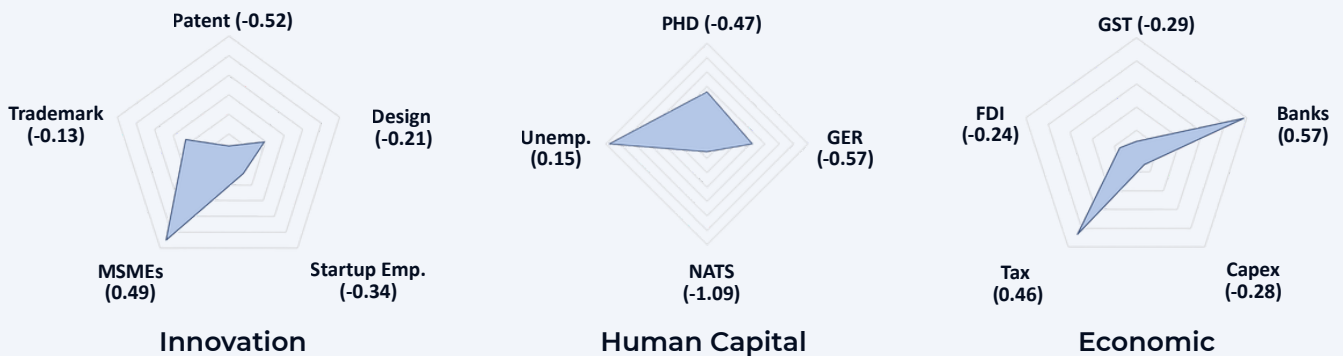
## RANKING TREND



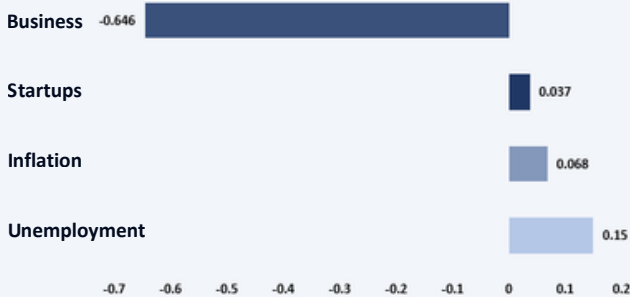
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS

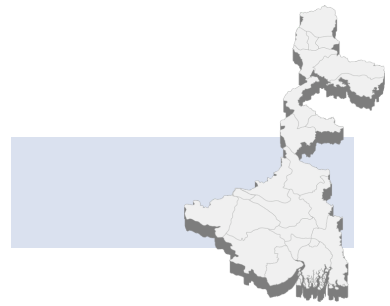


## KEY INFERENCES

- Steady Improvement:** Exhibits one of the highest positive momentum scores (+0.056), though its national rank has stabilised in 2023 after reaching a high of 14 in 2015.
- Economic Indicators:** Strong performance in connectivity density (0.655) and PhD enrollment (0.985), though Banking infrastructure (-1.02) remains a localised bottleneck.
- Output Gaps:** The Business and Patents pillars show substantial negative gaps, suggesting a lag in converting academic potential into commercial innovation.

# Rank 20

# WEST BENGAL



## OVERVIEW

POPULATION  
**100 million**



GSDP  
**USD 225 billion**



URBANISATION RATE  
**31.9%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank



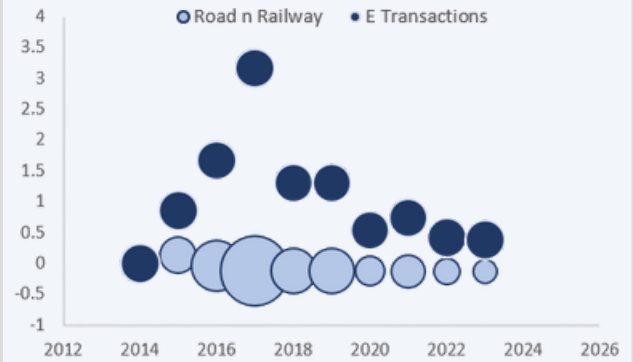
Up-trending Score

**+0.040**  
Index units per year

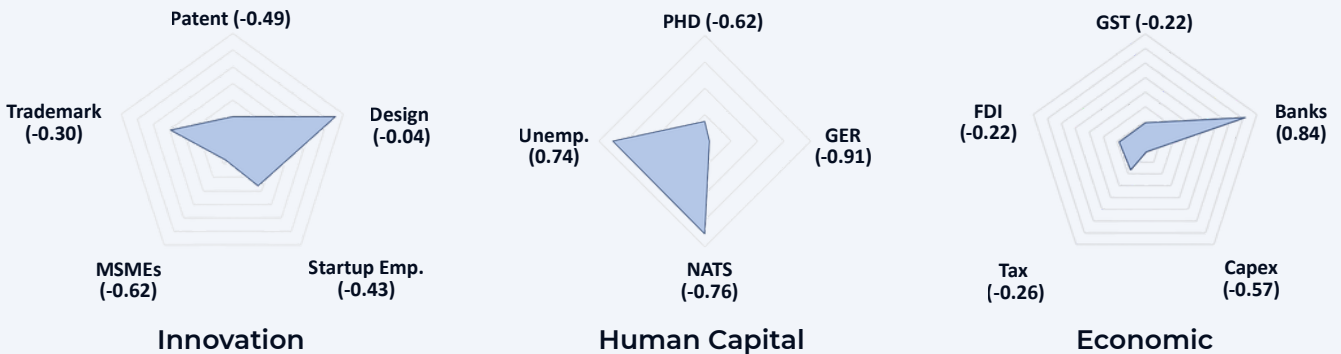
## RANKING TREND



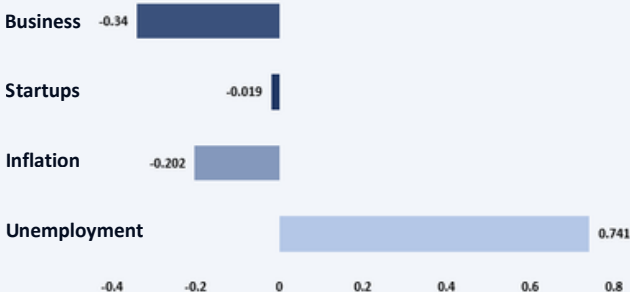
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS

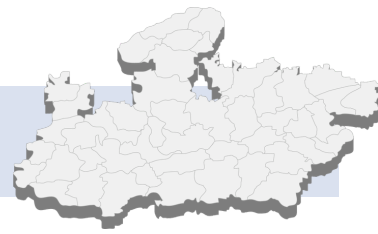


## KEY INFERENCES

- Ranking Decline:** National rank has seen a gradual descent from 13 in 2018 to 26 by 2023, accompanied by a positive but slowing momentum score (+0.040).
- Infrastructure Dominance:** Strong scores in physical enablers like Road and Railway connectivity (0.761) and Capital Expenditure (0.35).
- Innovation Bottlenecks:** Faces consistent deficits in MSME registration (-0.92) and Patents (-0.67), with the gap analysis showing Business as the primary area of friction.

Rank 21

# MADHYA P.



## OVERVIEW

POPULATION  
**87 million**



GSDP  
**USD 180 billion**



URBANISATION RATE  
**27.6%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank

1

4



PhD Enrollment



Design App.



MSME Reg.

Up-trending Score

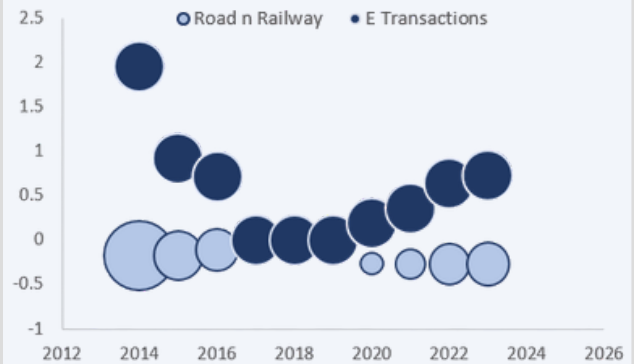
▲ **+0.060**

Index units per year

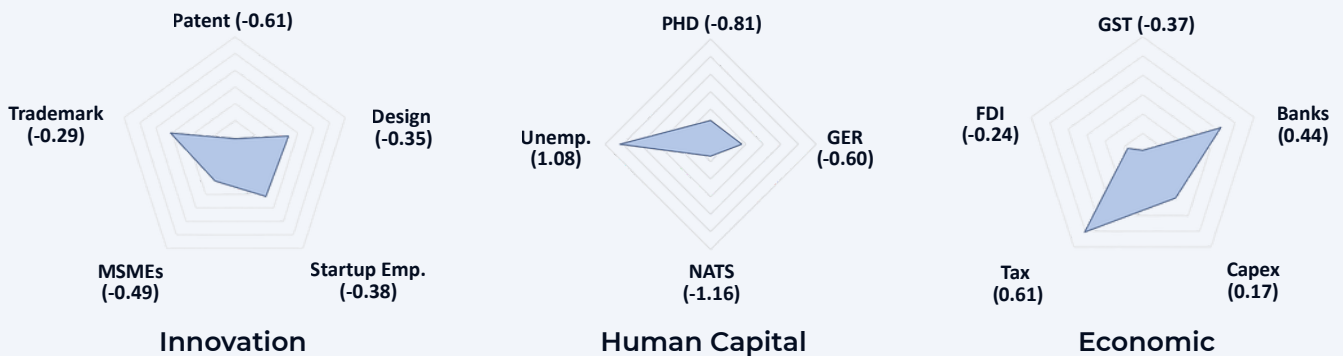
## RANKING TREND



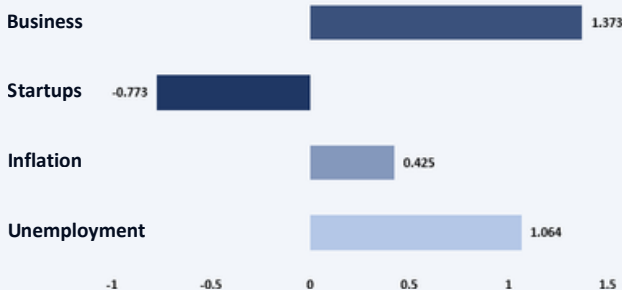
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS

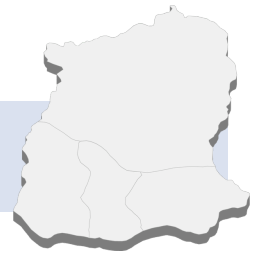


## KEY INFERENCES

- 1. **Consistent Momentum:** Displays the strongest upward trending score (+0.060) in this group, despite its national rank moving from 8 in 2014 to 24 in 2023.
- 2. **Educational Strength:** High PhD enrollment (0.741) and Design Application (0.348) metrics indicate a developing talent pipeline.
- 3. **Commercialisation Gap:** Severe gaps persist in Business pillars and Patent filings, suggesting that the state's growth is primarily driven by state-led enablers rather than private sector innovation.

# Rank 22

# SIKKIM



## OVERVIEW

POPULATION  
**0.7 million**



GSDP  
**USD 5.5 billion**



URBANISATION RATE  
**25.2%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank



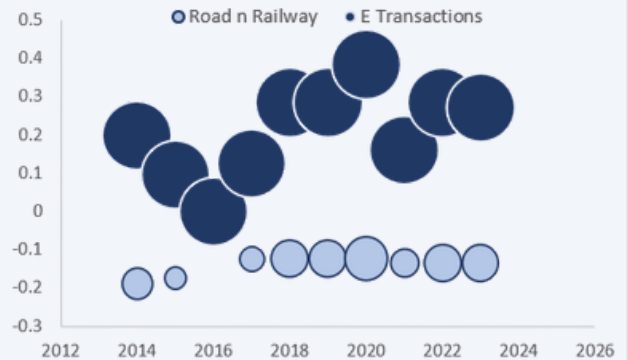
Up-trending Score

**+0.019**  
Index units per year

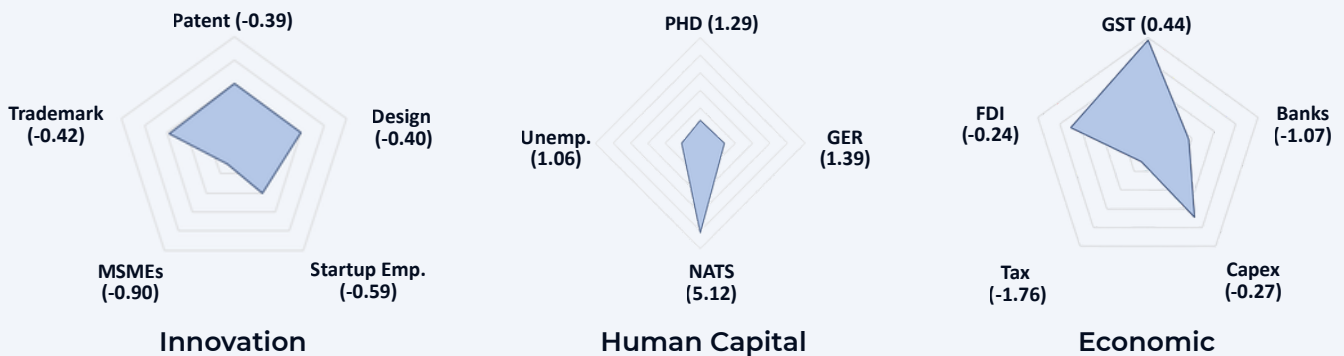
## RANKING TREND



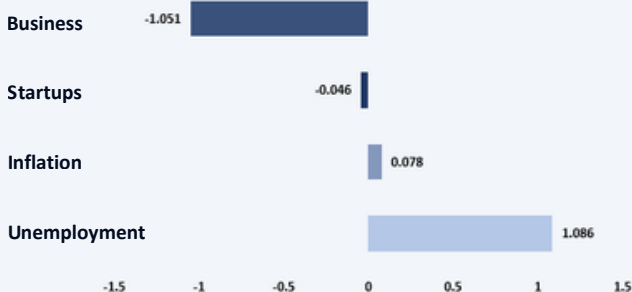
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



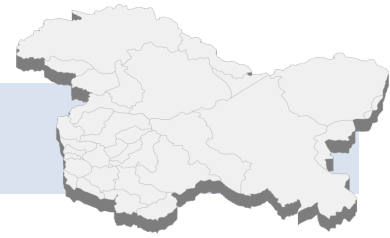
## GAP ANALYSIS



## KEY INFERENCES

- Modest Stability with Slow Progression:** Sikkim has oscillated between ranks 14 and 27, settling at rank 22 in 2023 with a slow positive trend (+0.019) reflecting a gradually stabilising ecosystem.
- Exceptional Human Capital Relative to Size:** The highest NATS score in the dataset (5.12), alongside strong PhD enrollment (1.29), represents a significant latent advantage for this small state.
- Infrastructure Unable to Match Talent:** Severely negative tax (-1.76), banking (-1.07), and MSMEs (-0.90) reveal that strong human capital is unsupported by the fiscal and business infrastructure.

# Rank 23 J&K



## OVERVIEW

POPULATION  
**14 million**



GSDP  
**USD 30 billion**



URBANISATION RATE  
**27.4%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank



Connectivity Density



Cap Ex.



Tax Revenue

Up-trending Score

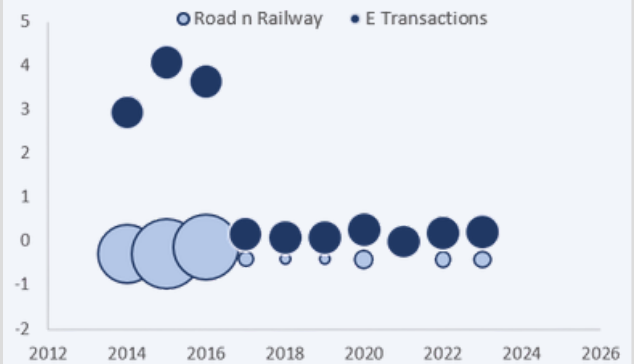
**+0.012**

Index units per year

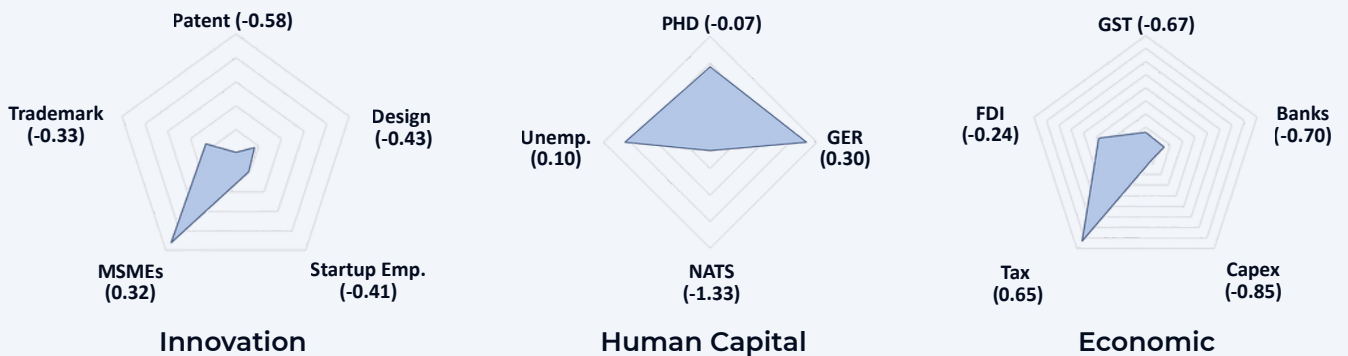
## RANKING TREND



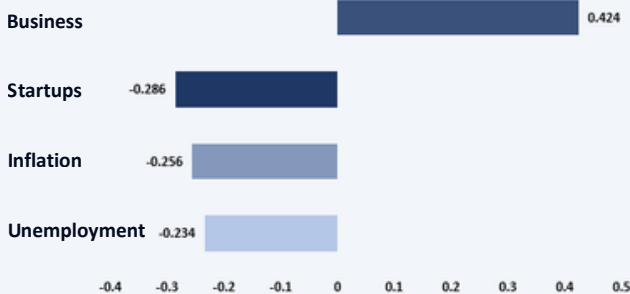
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



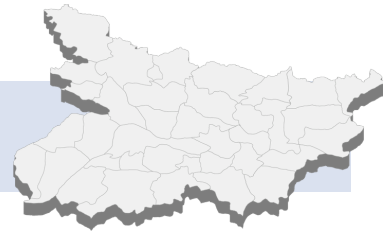
## GAP ANALYSIS



## KEY INFERENCES

- Gradual Post-Decline Recovery:** After dropping to rank 29 in 2019, J&K has recovered to rank 23 in 2023, though a near-flat trending score (+0.012) indicates the pace of improvement remains fragile.
- Connectivity as a Relative Strength:** Above-average road and railway connectivity scores indicate meaningful physical infrastructure progress, providing a logistical base for future economic activity.
- Pervasive Cross-Pillar Deficits:** Widespread negative scores in GST (-0.67), banking (-0.70), patents (-0.58), and NATS (-1.33) reflect deep structural constraints.

# Rank 24 BIHAR



## OVERVIEW

POPULATION  
**130 million**



GSDP  
**USD 104 billion**



URBANISATION RATE  
**11.3%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank

1



4



GER



Bank Branches



Rural Banks

Up-trending Score

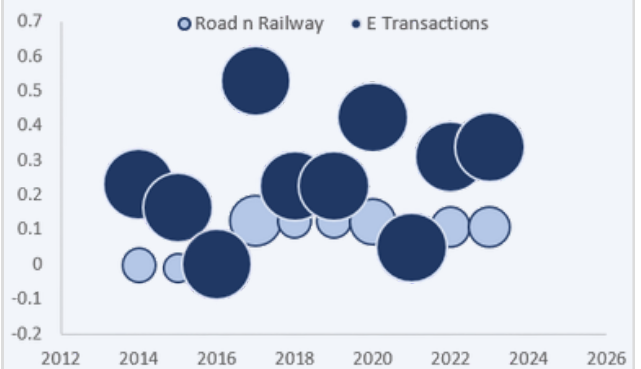
▲ **+0.057**

Index units per year

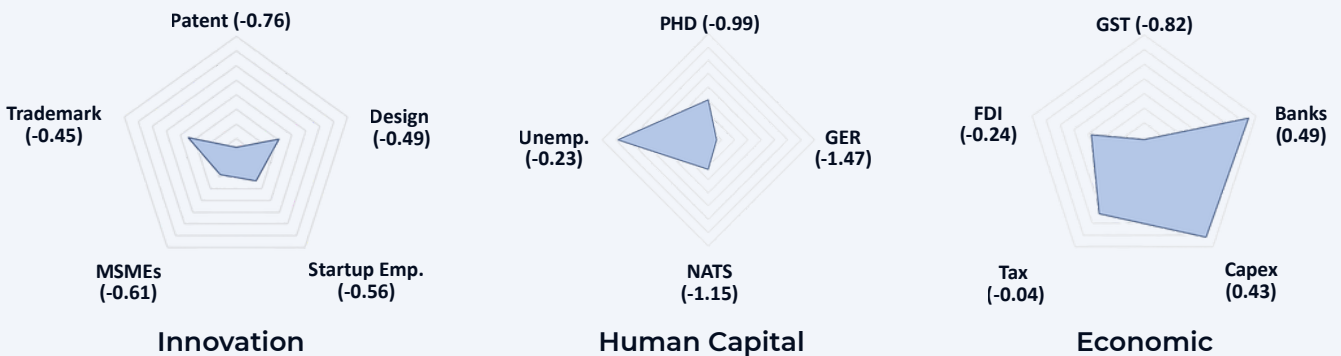
## RANKING TREND



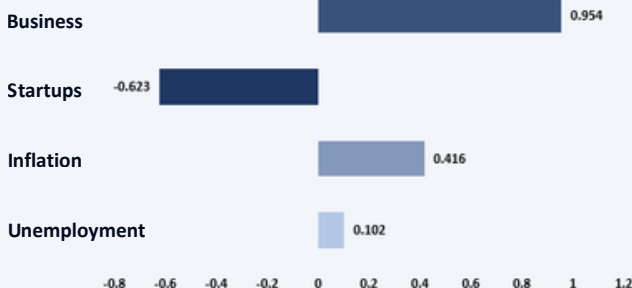
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS

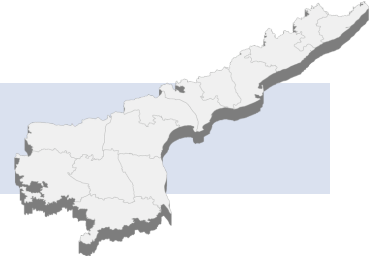


## KEY INFERENCES

- Inconsistent Progress Despite Strong Momentum:** Bihar carries a strong positive trend (+0.057), but its ranking has slipped to 26 in 2023, suggesting momentum has not overcome deep inertia.
- Physical Connectivity as a Key Enabler:** Improving road and railway infrastructure scores indicate a growing physical foundation that could support future economic and startup activity.
- Deep Innovation and Human Capital Deficits:** Severely negative patents (-0.76), PhD enrollment (-0.99), GER (-1.47), and MSMEs (-0.61) place Bihar among innovation-constrained states in the index.

# Rank 25

# ANDHRA P.



## OVERVIEW

POPULATION  
**54 million**



GSDP  
**USD 174 billion**



URBANISATION RATE  
**29.6%**

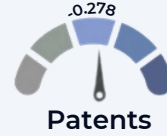


## KEY PERFORMANCE INDICATORS

Peer-Group Rank

1

5



Up-trending Score

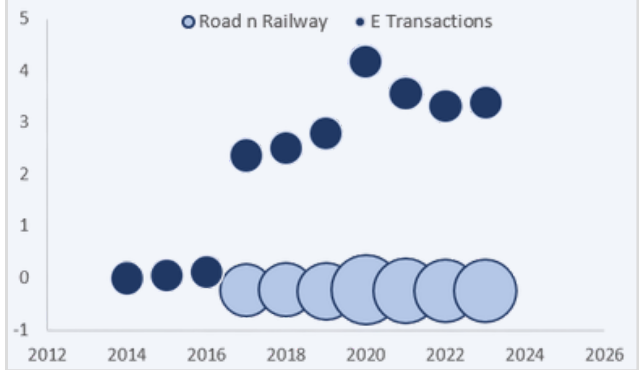
**+0.044**

Index units per year

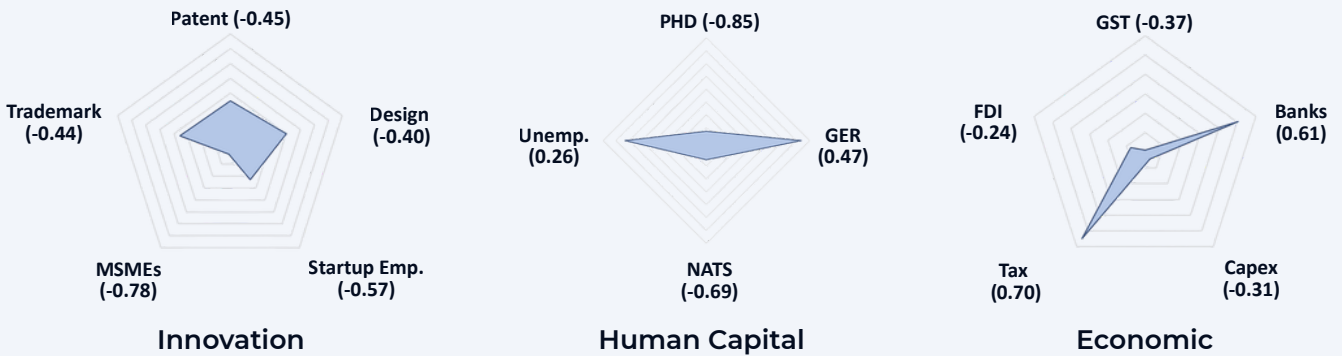
## RANKING TREND



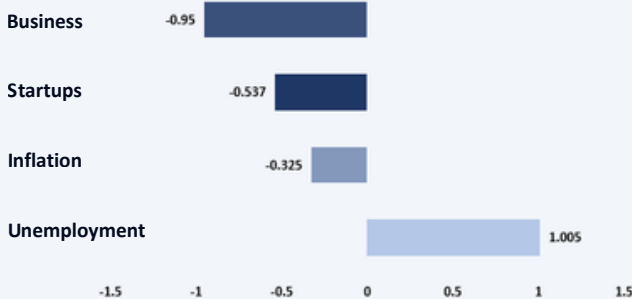
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS



## KEY INFERENCES

- 1. Volatile Ranking with Slow Stabilisation:** After a sharp drop from rank 9 in 2014 to rank 29 in 2015, Andhra Pradesh has partially recovered to rank 25 in 2023 with a modest positive trend (+0.044).
- 2. Digital Infrastructure as a Standout:** A strong e-transactions score (2.625) highlights significant progress in digital adoption, reflecting effective government-led technology enablement initiatives.
- 3. Private Innovation Ecosystem Underdeveloped:** Negative PhD enrollment (-0.85), MSMEs (-0.78), and startup employment (-0.57) indicate digital gains have not yet catalysed innovation activity.

# Rank 26

# CHHATTISGARH



## OVERVIEW

POPULATION  
**30 million**



GSDP  
**USD 61 billion**



URBANISATION RATE  
**23.2%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank

1



4



Up-trending Score

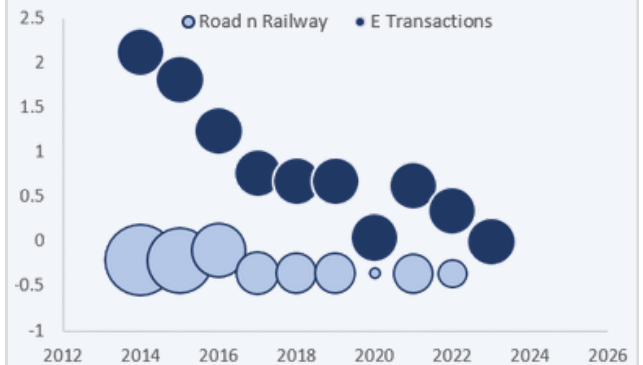
**+0.031**

Index units per year

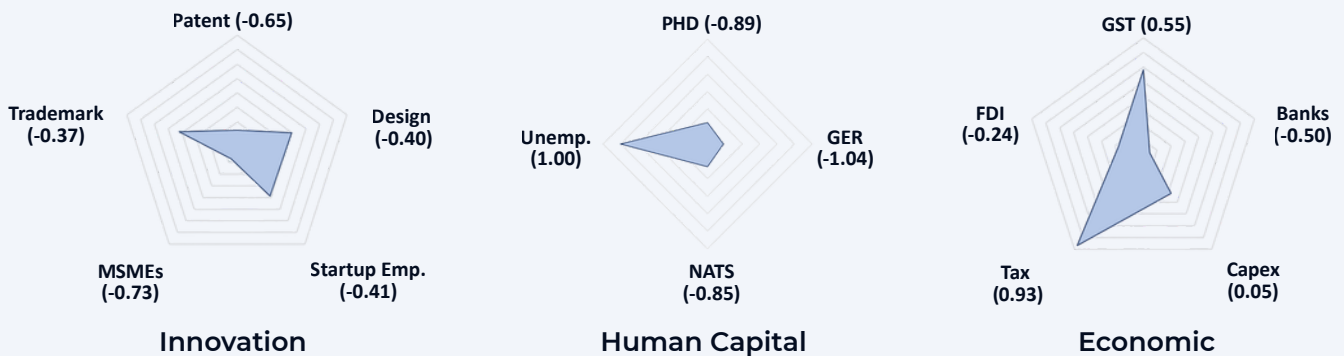
## RANKING TREND



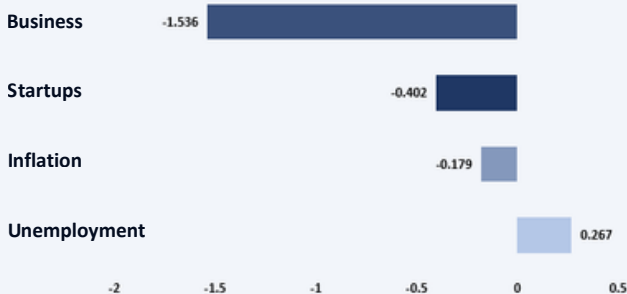
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



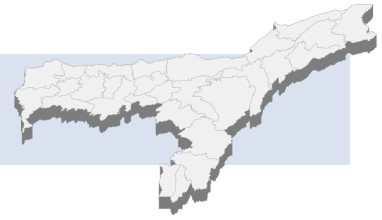
## GAP ANALYSIS



## KEY INFERENCES

- Slow Decline Despite Positive Momentum:** Despite a positive trend (+0.031), Chhattisgarh's ranking has slipped from 19 in 2014 to 27 in 2023, indicating the positive momentum.
- Resource Economy with Connectivity Strengths:** Strong road and railway connectivity and decent GST (0.55) and tax (0.93) scores reflect a resource-driven economy with a functional fiscal base.
- Broad Innovation and Talent Gaps:** Negative patents (-0.65), MSMEs (-0.73), and GER (-1.04) indicate an absence of the human capital and entrepreneurial culture needed for ecosystem growth.

# Rank 27 ASSAM



## OVERVIEW

POPULATION  
**36 million**



GSDP  
**USD 76 billion**



URBANISATION RATE  
**14.2%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank



GER



Bank Branches



Connect. Density

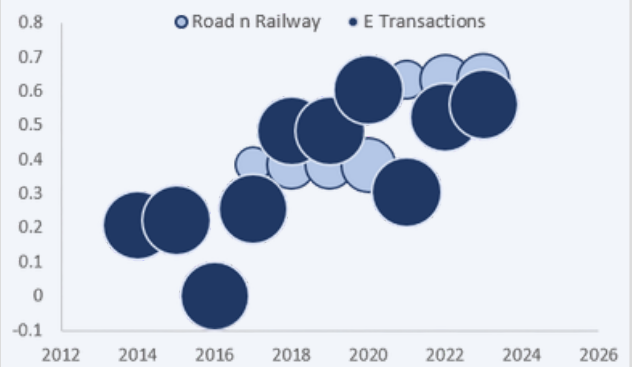
Up-trending Score

**+0.034**  
Index units per year

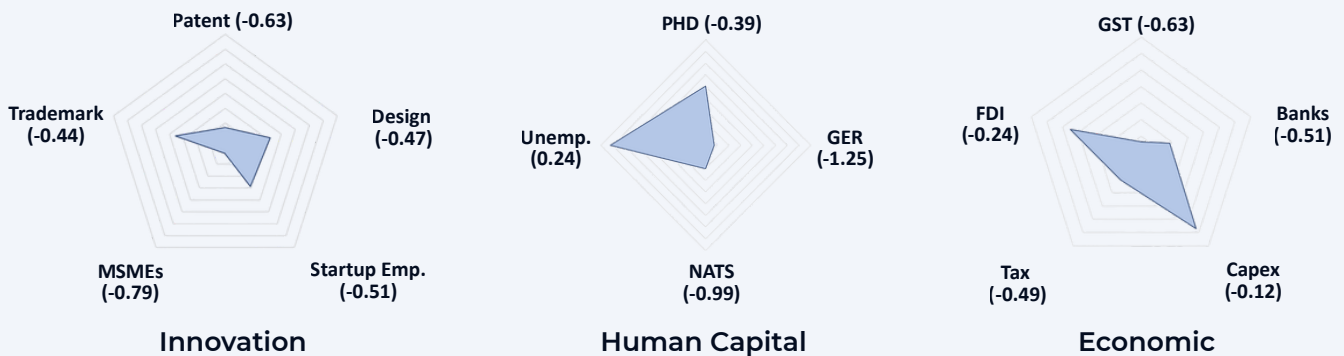
## RANKING TREND



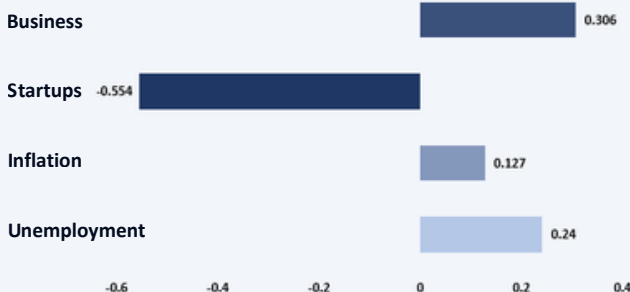
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS

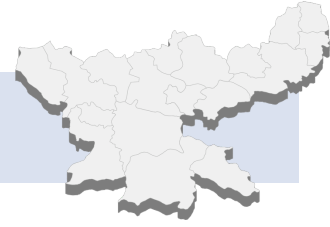


## KEY INFERENCES

- Slow Stabilisation in Lower Tier:** Assam has settled around ranks 23–27 over the decade with a modest positive trend (+0.034), indicating emerging but limited ecosystem momentum.
- Improving Physical Connectivity:** Above-average and improving road and railway scores suggest meaningful infrastructure development, providing a base for future economic activity in the Northeast.
- Comprehensive Innovation Deficits:** Deeply negative patents (-0.63), GER (-1.25), MSMEs (-0.79), and banking (-0.51) reflect an ecosystem requiring simultaneous intervention across all three pillars.

# Rank 28

# JHARKHAND



## OVERVIEW

POPULATION  
**40 million**



GSDP  
**USD 50 billion**



URBANISATION RATE  
**24.1%**

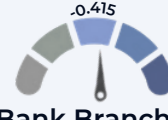


## KEY PERFORMANCE INDICATORS

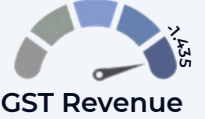
Peer-Group Rank



GER



Bank Branches



GST Revenue

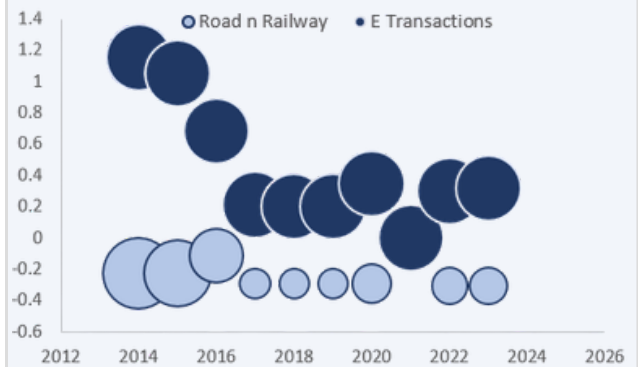
Up-trending Score

**+0.056**  
Index units per year

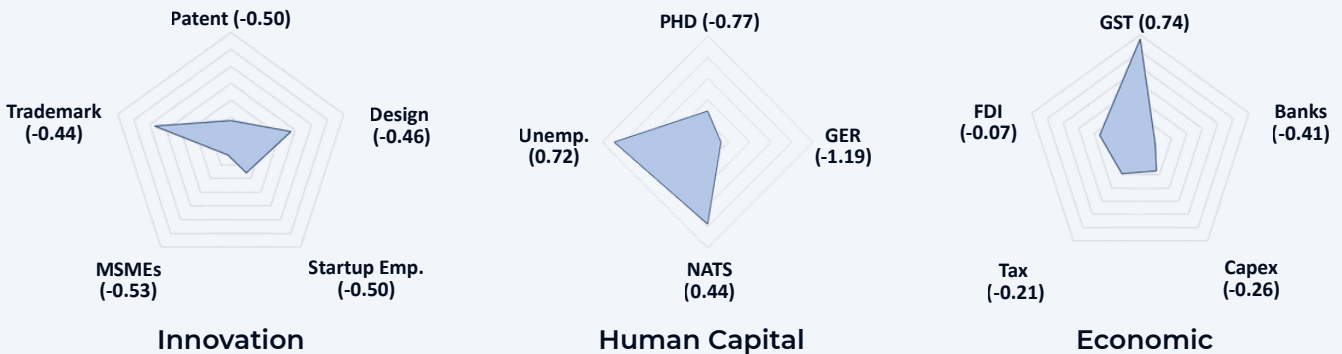
## RANKING TREND



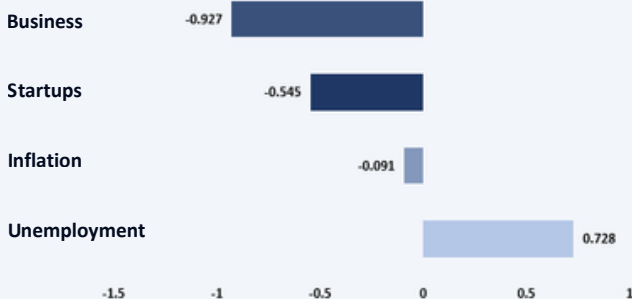
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS

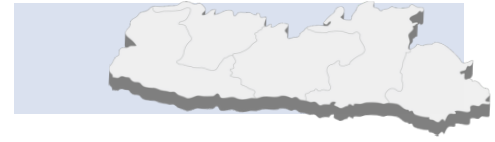


## KEY INFERENCES

- Persistently Low Ranking Despite Momentum:** Jharkhand holds a strong positive trend (+0.056) but remains at rank 30 in 2023, which shows structural barriers are neutralising improvement efforts.
- Connectivity and GST as Relative Strengths:** Strong road and railway infrastructure and a positive GST score (0.74) provide a functional economic base for a largely resource-driven state.
- Deep Cross-Pillar Innovation Gaps:** Negative patents (-0.50), MSMEs (-0.53), and GER (-1.19) highlight fundamental gaps across innovation, human capital, and economic dimensions.

# Rank 29

# MEGHALAYA



## OVERVIEW

POPULATION  
**2.97 million**



GSDP  
**USD 5.9 billion**



URBANISATION RATE  
**20.6%**



## KEY PERFORMANCE INDICATORS

Peer-Group Rank

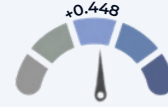
1



8



Bank Branches



PhD Enrollment



Rural Literacy

Down-trending Score

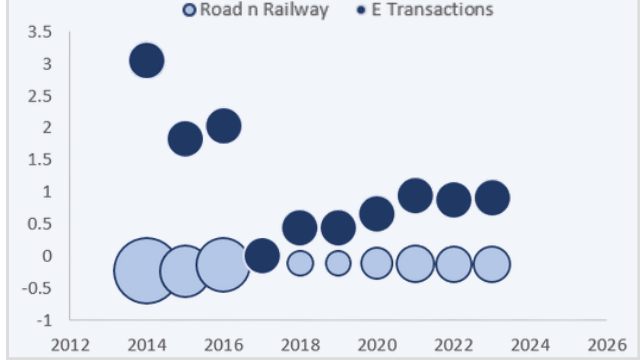
**-0.056**

Index units per year

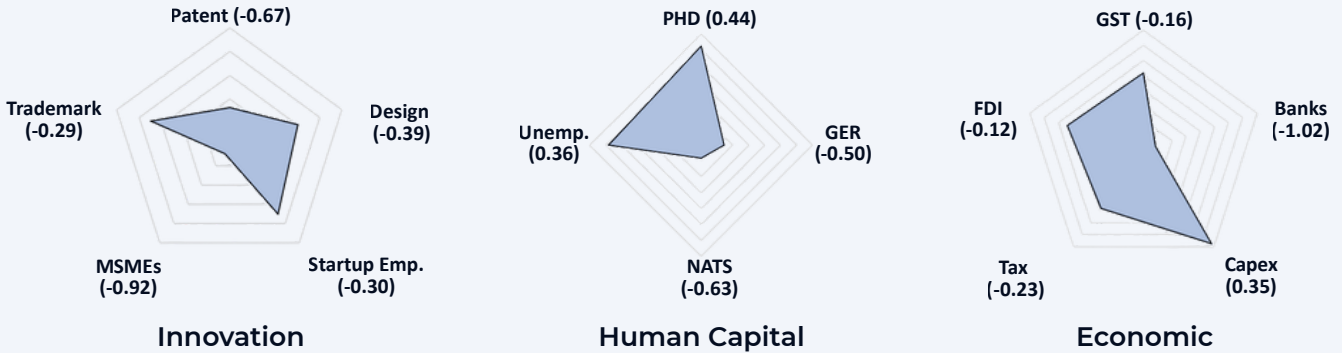
## RANKING TREND



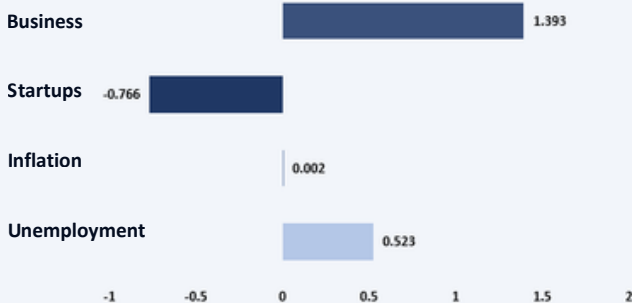
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS



## KEY INFERENCES

- Persistent Decline:** Meghalaya shows a consistent downward trend (-0.056), slipping to rank 29 in 2023 with no significant recovery, indicating a deteriorating startup ecosystem.
- Human Capital Strength:** Strong rural literacy (+1.409) and PhD enrollment (+0.448) offer a foundation, but these gains remain disconnected from commercial innovation output.
- Critical Structural Gaps:** Severe deficits in banking (-1.02), MSMEs (-0.92), and patents (-0.67) highlight deep structural barriers to business formation and scaling.

# Rank 30 TRIPURA



## OVERVIEW

POPULATION  
**4 million**



GSDP  
**USD 9 billion**



URBANISATION RATE  
**26.1%**



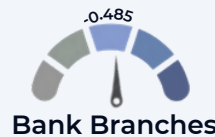
## KEY PERFORMANCE INDICATORS

Peer-Group Rank

1



8

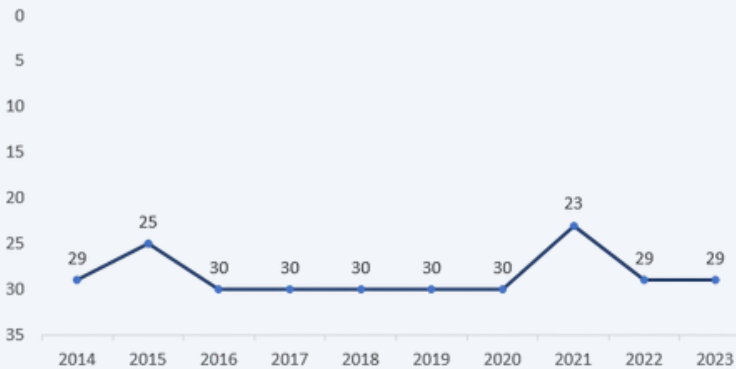


Up-trending Score

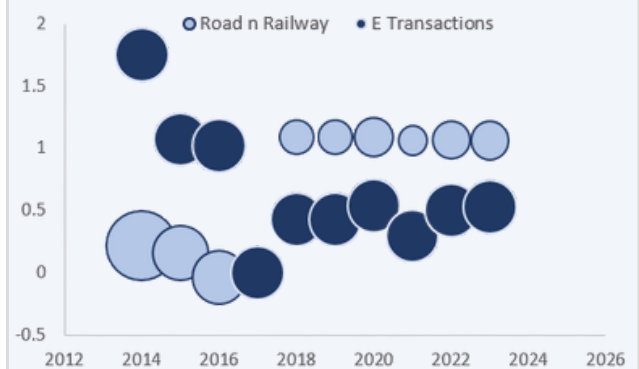
▲ **+0.007**

Index units per year

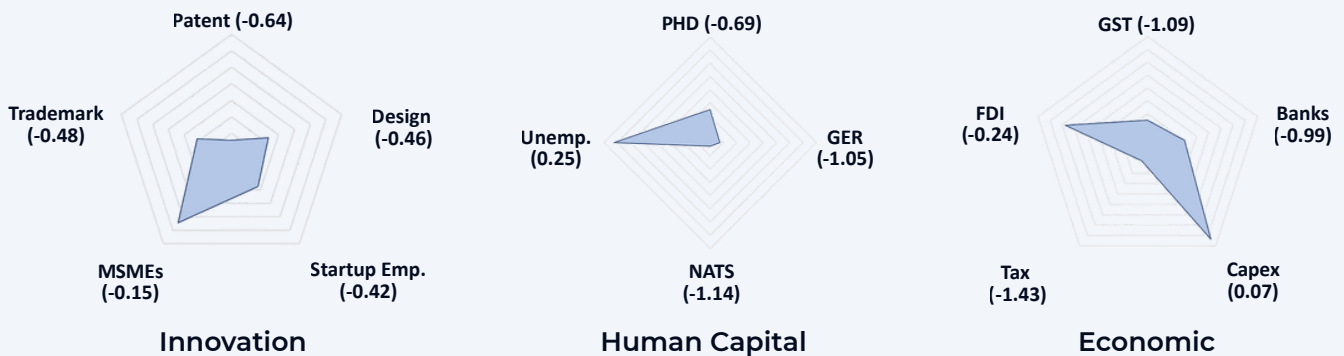
## RANKING TREND



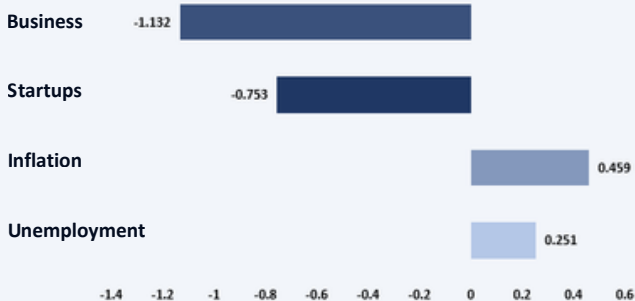
## BUBBLE ANALYSIS



## RADAR CHART ANALYSIS



## GAP ANALYSIS



## KEY INFERENCES

- Chronically Anchored at the Bottom:** Tripura has remained between ranks 23 and 30 throughout the decade, with a near-zero trend (+0.007) indicating effectively stagnant ecosystem development.
- Physical Connectivity as the Sole Bright Spot:** Relatively strong road and railway scores stand out as the state's primary asset, yet have not been leveraged for economic or innovation development.
- Comprehensive Structural Underdevelopment:** Negative scores across GST (-1.09), banking (-0.99), patents (-0.64), and tax (-1.43) place Tripura among the most underperforming states in the index.

# POLICY RECOMMENDATIONS

This section explores prospective policy reforms and recommendations which may be explored to address the critical focus areas identified through data analysis. These recommendations are based on real-world evidence and precedents relevant to the target areas, exploring their impact and implementation to truly assess their feasibility and effectiveness.

## **Decentralised Tech-Transfer Offices (TCOs)**

The solution proposes the establishment of formal Tech-Transfer Offices (TCOs) within universities as part of their innovation ecosystems in high-research but low-commercialisation states. The TCOs will be staffed by a small but specialised team consisting of an IP lawyer responsible for handling patent filing, IP protection, licensing, and negotiations; a venture builder responsible for identifying commercialisable research projects within the university and structuring equity arrangements; and a business operations manager handling incorporation, regulatory filings, and financial management of chosen projects. Their compensation structure would have two

components: a base salary, fixed and guaranteed, along with an equity bonus tied to the performance of successfully incubated companies. This will align the TCO staff with successful commercialisation and incentivise them to identify which researchers have commercial potential and be committed to their sustenance and growth.

Supporting evidence includes the Technion Institute of Technology in Israel, which operates Technion Transfer, a tech transfer office that has incubated 300+ companies. Israel's economy is vastly smaller than India's, yet it has generated more than Rs. 10,000 crore in annual startup investment. At India's scale, TCO impact can be proportionally larger than this.

IIT Bombay Society of Innovation and Entrepreneurship incubation cell is a precedent in India, which has incubated 300+ startups with a combined valuation of more than Rs. 2,000 crore. However, it is located in an extremely favourable environment. Replacing the incubation cell with TCOs in target states would require adapting the model to constrained environments,

but has potential to achieve similar or better results.

### **Statutory SLA Enforcement for Regulatory Approvals**

India's business reform action plan has digitalised numerous licensing and registration portals over the past 10 years, which should have reduced compliance time and regulatory friction. However, analysis shows that they persist in states even with sophisticated portal systems.

The proposed solution suggests enforcing timelines for service delivery along with the existence of digital systems. For core startup-relevant registrations and approvals, statutory maximum processing times should be clearly defined. If a state bureaucracy fails to process and approve an application within the SLA window, the application will be automatically approved. Thus, the burden would shift to the government. In case they want to deny or request additional information, they must do so within the SLA window. Controlling mechanisms would include quarterly reporting with defined consequences if a state fails to achieve a 90%+ SLA.

The reform will lead to reduced burn rate for early-stage startups, help reverse selection bias towards founders with capital and connections who are more likely to

complete registrations, making entrepreneurship accessible to a broader talent base.

A World Bank study in 2018 analysing 120+ countries found that countries with statutory SLA enforcement for business registrations had 33% higher startup formation rates, with 2.5x faster average approval times, and 15-20% higher startup survival rates.

### **Geographic Inclusivity Quotas**

The proposed reform suggests the introduction of a mandate; any AIF receiving capital from government-backed FFS must allocate at least 15% of deployed capital to ventures located in cluster 2 states and non-metropolitan tier 2-3 regions, cities with a population of less than 5 million and less than 20 existing VC-backed startups, for example, Indore, Chandigarh, Jaipur, Pune, etc. To de-risk regional investments, the government can provide first-loss guarantees where it absorbs the first 25% of losses. This changes the risk-return profile and makes regional startup investment more attractive. Co-investment matching can also de-risk, where the government commits Rs. 0.3-0.5 in co-investment for every Rs. 1 the AIF commits to regional startups. This reduces their capital requirement and improves return rates. Performance tracking and control mechanisms would include a quarterly reporting system to DPIIT.

OECD published a comprehensive analysis in 2019 of venture capital allocation across 40+ countries. Key findings show that in countries relying purely on market-driven capital allocation with no government intervention, venture capital becomes 70-80% more concentrated in the capital city or major metro cities. However, countries implementing geographic co-investment mandates and quotas show that only 40-60% of capital is allocated to primary hubs, with the remainder allocated to secondary regions.

### **Digital Service Leapfrogging**

The proposed solution is to prioritise building digital service economies in cluster 2 states, which renders geographic and logistics constraints irrelevant. Subsidised broadband infrastructure is crucial for digital service business models to function. Cluster 2 states have specific economic strengths, such as artisanal crafts, tourism potential, etc.; building digital startups serves these sectors and creates value from regional strengths. A mandate of 10% government procurement of digital services from cluster 2-based startups will create a guaranteed customer base, enabling them to achieve early revenue milestones and reduce capital requirements.

Bangalore was a tier-two city in the 1990s, and over 20 years,

through deliberate investment in broadband infrastructure, tax incentives for IT companies, and talent attraction programs, it became India's IT capital. Thus, Bangalore's growth was not inevitable; it resulted from deliberate policy action and reform. A similar trajectory can be adopted for cluster 2 states, adapted for digital services rather than IT companies.

# CONCLUSION

The Startup and Innovation Index provides a comprehensive multi-year evaluation of India's innovation and startup ecosystem from the year 2014 to 2024. It utilises a robust methodology using multi-criteria decision-making framework in order to track long-term structural capabilities rather than temporary economic spikes. The resultant 10-year average matrix and k-means clustering solutions have helped identify critical areas which require action and economic planning.

The empirical core of this dashboard is that India cannot be treated as a uniform startup ecosystem. The primary 3-cluster model has categorised the states into three distinct ecosystems which operate on entirely different baselines. Delhi stands alone as a developed entrepreneurial hub, while 17 states come under mainstream performers representing the industrial and resource engines of India. These are states with strong physical infrastructure and innovational capabilities, but their progress is hindered due to administrative and regulatory bottlenecks. And lastly, the developing frontiers comprising of 12 states including the Northeastern and Himalayan territories.

This cluster reflects potential through high intellectual scores, but remains uncaptialised and isolated from the mainstream commercial markets.

The index concludes by providing an actionable framework of policy intervention to correct these market imbalances and unlock sustainable growth. For mainstream performers, the priority lies in making the regulatory environment more accessible and efficient, while the developing frontiers require digitalisation and localised knowledge networks.

However, it is important to acknowledge that certain data gaps remain. The lack of consistent data and large fluctuations may introduce minor errors in the analysis. As state statistics become more standardised and uniform through portals like Udyam and Startup India, future iterations in the startup and innovation index become possible, which can expand down to district and municipal levels. This would allow the researchers to address economic disparities within the states themselves and ensure a highly equitable roadmap towards an innovation-driven economy.



# APPENDIX

## Legend and Weights

CODE	PARAMETER	WEIGHTS
P1	State wise average inflation	0.0345
P2	Gross State Value Added by Economic Activity	0.034
P3	Growth rate of startup registrations	0.0342
P4	State wise GST	0.0346
P5	Applications for patents filed	0.0345
P6	Applications for Geographical Indicators	0.0345
P7	State Social Expenditure	0.0346
P8	No of E transactions	0.0348
P9	State-wise Number of Regional Rural Banks	0.0344
P10	Bank Branches	0.0343
P11	State-wise capital expenditure	0.0345
P12	Number of Design Applications	0.0346
P13	State-wise enrolment in PhD courses	0.0345
P14	Gross enrolment ratio	0.0343
P15	Road density	0.0345
P16	Number of MSME registered	0.0344
P17	State-Wise Railway Route	0.0351
P18	State-Wise Tax Revenue	0.0342
P19	Ease of Doing Business	0.0344
P20	Number of DPIIT-recognised startups	0.0344
P21	Employment Generation Through Start-ups	0.0346
P22	Number of Apprentices Engaged under NATS	0.0345
P23	Unemployment Rate State wise	0.0341
P24	Number of people employed in MSMEs	0.0345
P25	Funds Allocated and Utilised under SVEP	0.0348
P26	Applications for Trademarks	0.0346
P27	Rural Literacy Rate	0.0342
P28	FDI Inflow by State (US\$ Million)	0.0346
P29	Women led startups	0.0348

## Normalised Average Scores

STATES	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15
Andhra Pradesh	-0.18	-0.63	-0.39	-0.38	-0.45	-0.55	-0.26	1.47	0.65	0.61	-0.31	-0.40	-0.86	0.47	-0.41
Arunachal Pradesh	-2.40	1.87	-0.73	-0.88	-0.54	0.98	0.49	-0.70	-0.80	-1.07	4.72	-0.47	1.15	0.32	-0.74
Assam	0.13	-0.50	-0.51	-0.63	-0.63	-0.48	-0.26	-0.70	-0.28	-0.52	-0.13	-0.48	-0.39	-1.26	0.77
Bihar	-0.26	-0.58	-0.38	-0.83	-0.76	-0.70	-0.25	-0.61	1.57	0.49	0.44	-0.49	-1.00	-1.47	0.14
Chhattisgarh	-0.33	-0.51	-0.46	0.56	-0.66	-0.50	-0.23	0.74	-0.12	-0.51	0.05	-0.40	-0.89	-1.04	-0.60
Delhi	-0.43	-0.71	1.90	0.41	3.38	-0.86	-0.27	-0.37	-0.83	-0.26	-0.86	4.76	2.50	2.00	4.16
Goa	-0.11	-0.62	-0.64	0.89	0.42	0.98	-0.25	-0.58	-0.83	-0.95	-0.20	-0.23	0.25	0.46	0.77
Gujarat	-0.06	0.23	0.76	0.65	-0.07	-0.49	-0.22	0.73	0.01	0.75	-0.32	1.06	-0.64	-0.71	-0.51
Haryana	-0.07	-0.66	0.44	1.58	0.34	-0.86	-0.26	0.14	-0.08	0.02	-0.50	0.49	-0.41	0.10	-0.48
Himachal Pradesh	-0.19	-0.61	-0.68	0.45	0.18	0.82	-0.17	0.25	-0.57	-0.74	-0.12	0.26	0.10	0.97	-0.49
Jammu and Kashmir	0.42	-0.71	-0.62	-0.68	-0.59	0.07	-0.27	0.43	-0.45	-0.70	-0.86	-0.43	-0.07	0.31	-0.71
Jharkhand	-0.09	-0.26	-0.54	0.75	-0.50	-0.86	-0.25	-0.36	-0.31	-0.41	-0.26	-0.47	-0.77	-1.19	-0.55
Karnataka	0.22	-0.28	1.92	0.96	1.33	0.20	-0.16	-0.37	1.18	1.25	-0.31	0.02	-0.14	0.22	-0.23
Kerala	0.30	-0.49	0.18	-0.70	-0.28	0.47	-0.26	1.55	-0.11	0.41	-0.50	-0.15	-0.16	0.69	1.15
Madhya Pradesh	0.08	-0.67	-0.10	-0.38	-0.61	-0.63	-0.26	0.05	0.71	0.45	0.18	-0.36	-0.82	-0.61	-0.47
Maharashtra	-0.26	-0.62	3.36	1.13	1.09	-0.48	-0.26	-0.54	0.03	1.86	-0.50	0.68	-0.64	0.40	-0.18
Manipur	1.11	-0.63	-0.71	-1.08	-0.69	1.63	-0.22	-0.60	-0.80	-1.06	1.04	-0.48	0.64	0.63	-0.43
Meghalaya	0.00	-0.68	-0.73	-0.23	-0.67	0.22	-0.26	0.02	-0.73	-1.03	0.35	-0.49	0.45	-0.50	-0.27
Mizoram	-0.04	1.70	-0.73	-1.11	-0.33	2.12	5.19	-0.22	-0.73	-1.06	0.72	-0.29	2.28	-0.16	-0.65
Nagaland	0.04	1.28	-0.72	-1.11	-0.70	1.26	-0.25	-0.55	-0.82	-1.07	0.27	-0.48	-0.11	-1.23	-0.11
Odisha	0.05	2.37	-0.35	0.76	-0.55	-0.25	-0.24	-0.52	0.32	0.03	-0.01	-0.40	-0.78	-0.82	-0.20
Punjab	-0.06	1.78	-0.51	-0.28	0.91	-0.83	-0.26	0.15	-0.36	0.38	-0.64	0.25	0.26	-0.03	0.06
Rajasthan	0.07	-0.58	-0.02	-0.30	-0.53	-0.55	-0.26	-0.38	0.91	0.58	-0.28	-0.22	-0.48	-0.57	-0.56
Sikkim	0.43	-0.58	-0.73	0.44	-0.40	1.85	-0.25	-0.59	-0.83	-1.07	-0.28	-0.40	1.29	1.39	-0.27
Tamil Nadu	0.42	-0.64	0.66	0.34	1.41	-0.15	-0.26	-0.09	-0.16	1.44	-0.47	0.24	0.75	2.00	-0.16
Telangana	0.37	1.66	0.44	0.42	0.87	-0.25	0.36	1.65	0.24	0.11	-0.27	-0.19	-0.43	1.00	0.28
Tripura	0.46	-0.67	-0.72	-1.10	-0.64	-0.38	-0.27	-0.36	-0.67	-0.99	0.08	-0.47	-0.69	-1.05	1.58
Uttar Pradesh	0.06	-0.63	1.22	-0.06	-0.39	-0.65	-0.20	-0.32	4.05	2.86	-0.21	-0.32	-0.74	-0.37	-0.24
Uttarakhand	0.13	0.62	-0.55	0.62	0.58	-0.55	0.33	0.46	-0.50	-0.63	-0.26	-0.11	0.97	0.97	-0.51
West Bengal	-0.20	-0.67	-0.05	-0.22	-0.50	-0.56	-0.26	0.24	0.30	0.84	-0.58	-0.05	-0.62	-0.91	-0.13

## Normalised Average Scores

STATES	P16	P17	P18	P19	P20	P21	P22	P23	P24	P25	P26	P27	P28	P29
Andhra Pradesh	0.54	0.00	0.70	-1.54	-0.40	-0.57	-0.70	0.27	-0.79	-0.29	-0.44	-1.74	-0.25	-0.50
Arunachal Pradesh	-0.88	-0.01	-0.55	1.55	-0.77	-0.53	-0.83	-0.43	-0.77	-0.01	-0.49	0.04	-0.25	-0.53
Assam	-0.38	0.02	-0.49	0.31	-0.55	-0.51	-1.00	0.24	-0.79	-0.01	-0.44	0.39	-0.25	-0.46
Bihar	0.56	0.01	0.04	0.42	-0.29	-0.57	-1.15	-0.23	-0.62	0.29	-0.46	-0.99	-0.25	-0.51
Chhattisgarh	-0.53	0.00	0.94	-0.95	-0.54	-0.41	-0.85	1.01	-0.73	0.32	-0.38	-0.61	-0.25	-0.37
Delhi	-0.49	-0.01	-0.70	0.24	1.62	4.27	0.20	-0.20	1.51	-0.60	4.93	1.05	-0.25	4.52
Goa	-0.86	-0.01	0.94	0.34	-0.69	0.57	2.71	-1.81	0.15	-0.45	0.46	1.11	-0.25	1.50
Gujarat	0.51	0.00	-0.15	-1.23	1.22	0.49	-0.33	1.07	0.23	-0.46	0.49	-0.19	1.01	0.16
Haryana	-0.48	-0.00	0.38	-0.81	0.45	1.23	1.97	-0.67	0.89	-0.40	0.81	-0.30	-0.25	0.93
Himachal Pradesh	-0.72	-0.00	-0.26	-0.34	-0.70	-0.46	-0.53	0.20	-0.21	-0.56	-0.16	0.61	-0.11	-0.38
Jammu and Kashmir	-0.59	-0.00	0.66	0.95	-0.62	-0.41	-1.34	0.10	0.32	-0.20	-0.34	-0.36	-0.25	-0.42
Jharkhand	-0.22	0.02	-0.22	-0.93	-0.55	-0.51	0.44	0.73	-0.53	0.09	-0.45	-0.98	-0.07	-0.43
Karnataka	0.73	-0.00	0.70	-0.62	1.61	0.70	-0.14	0.77	0.83	-0.56	0.03	-0.66	-0.24	0.65
Kerala	0.11	-0.01	0.62	0.46	0.20	0.08	-0.01	-1.30	-0.43	0.61	0.09	1.35	-0.25	-0.00
Madhya Pradesh	0.24	0.01	0.61	-1.05	-0.05	-0.38	-1.16	1.09	-0.50	-0.08	-0.29	-1.09	-0.24	-0.35
Maharashtra	1.13	-0.00	0.85	-0.57	3.37	0.60	1.88	0.49	0.77	-0.56	0.49	-0.01	-0.08	0.59
Manipur	-0.81	-0.01	-1.00	1.33	-0.74	-0.36	-1.30	-0.86	1.33	1.41	-0.48	0.87	-0.25	-0.43
Meghalaya	-0.84	-0.01	-0.24	1.39	-0.77	-0.60	-1.27	0.52	-1.33	0.77	-0.50	1.41	-0.25	-0.57
Mizoram	-0.87	-0.01	-1.92	1.25	-0.77	-0.61	-1.16	0.16	-0.50	2.52	-0.51	1.97	-0.25	-0.54
Nagaland	-0.85	-0.01	-1.83	1.21	-0.76	0.25	-1.38	-2.59	-0.88	0.29	-0.49	1.56	-0.20	-0.47
Odisha	-0.05	0.01	0.45	-0.20	-0.35	-0.32	2.71	-0.02	-0.38	-0.46	-0.45	-0.64	5.14	-0.32
Punjab	-0.27	0.00	0.38	-0.21	-0.50	-0.27	-1.10	-0.48	-0.09	-0.37	0.23	-0.24	-0.25	-0.36
Rajasthan	0.24	0.01	0.46	-0.65	0.04	-0.34	-1.09	0.15	0.50	-0.28	-0.14	-1.38	-0.25	-0.30
Sikkim	-0.88	-0.01	-1.77	1.37	-0.77	-0.60	5.12	1.06	-0.90	-0.06	-0.42	0.27	-0.25	-0.56
Tamil Nadu	1.20	-0.00	0.55	-0.34	0.73	-0.03	3.46	0.01	1.14	-0.55	-0.05	-0.07	-0.25	-0.05
Telangana	0.21	-0.00	1.46	1.01	0.42	0.45	-1.40	-0.21	2.29	-0.40	0.09	-1.56	-0.25	0.49
Tripura	-0.80	0.00	-1.43	-1.13	-0.75	-0.43	-1.15	0.25	-0.15	0.32	-0.48	1.13	-0.25	-0.54
Uttar Pradesh	2.91	0.01	1.45	-0.32	1.52	-0.32	-1.02	0.36	-0.67	-0.26	-0.29	-0.91	-0.05	-0.28
Uttarakhand	-0.71	-0.01	-0.38	-0.63	-0.59	0.05	-0.35	-0.42	0.93	-0.07	-0.04	0.12	-0.23	-0.09
West Bengal	2.85	0.00	-0.27	-0.34	-0.02	-0.44	0.76	0.74	-0.63	-0.11	-0.31	-0.16	-0.23	-0.40

## K-Means Clustering (K=3)

Cluser Membership		
State	Cluster	Distance
Andhra Pradesh	1	3.006
Arunachal Pradesh	2	5.696
Assam	2	2.793
Bihar	1	3.306
Chhattisgarh	1	3.069
Delhi	3	0.000
Goa	2	3.793
Gujarat	1	2.657
Haryana	1	3.173
Himachal Pradesh	2	2.489
Jammu & Kashmir	2	2.958
Jharkhand	1	3.037
Karnataka	1	3.222
Kerala	1	3.883
Madhya Pradesh	1	2.266
Maharashtra	1	5.401
Manipur	2	3.040
Meghalaya	2	2.283
Mizoram	2	6.545
Nagaland	2	3.853
Odisha	1	7.074
Punjab	1	3.276
Rajasthan	1	1.924
Sikkim	2	4.268
Tamil Nadu	1	3.959
Telangana	1	4.361
Tripura	2	3.613
Uttar Pradesh	1	5.268
Uttarakhand	2	3.110
West Bengal	1	2.886

## K-Means Clustering (K=3)

Final Cluster Centers			
Parameter	Cluster 1	Cluster 2	Cluster 3
P1	0.093	0.056	-0.385
P2	-0.633	1.707	-0.710
P3	1.353	-0.834	2.137
P4	-0.064	-1.105	0.418
P5	-0.389	-0.410	3.351
P6	-0.624	2.483	-0.825
P7	-0.201	5.194	-0.264
P8	-0.273	-0.315	-0.243
P9	4.052	-0.732	-0.831
P10	2.860	-1.063	-0.264
P11	-0.208	0.701	-0.837
P12	-0.331	-0.295	4.742
P13	-0.730	2.236	2.621
P14	-0.442	-0.183	1.927
P15	-0.243	-0.655	4.144
P16	2.811	-0.883	-0.486
P17	0.008	-0.009	-0.009
P18	1.454	-1.959	-0.696
P19	-0.325	1.253	0.242
P20	1.525	-0.774	1.574
P21	-0.333	-0.568	4.261
P22	-0.561	-0.650	0.099
P23	0.372	0.180	-0.120
P24	-0.690	-0.520	1.516
P25	-0.305	2.584	-0.564
P26	-0.291	-0.497	4.937
P27	-0.913	1.969	1.047
P28	-0.054	-0.248	-0.248
P29	-0.039	-0.177	-0.177

Iteration History				
Iteration	Cluster 1	Cluster 2	Cluster 3	Cluster 4
1	5.308	5.917	0.000	4.525
2	0.367	0.166	0.000	0.798
3	0.149	0.000	0.000	0.228
4	0.000	0.000	0.000	0

## K-Means Clustering (K=3)

ANOVA						
Parameter	Cluster Mean Square	df	Error Mean Square	df	F	Sig.
P1	0.817	2	0.995	27	0.821	0.451
P2	18.353	2	0.272	27	67.450	0.000
P3	16.046	2	0.443	27	36.231	0.000
P4	2.281	2	0.928	27	2.458	0.104
P5	8.132	2	0.401	27	20.300	0.000
P6	13.311	2	0.018	27	730.839	0.000
P7	14.338	2	0.014	27	1005.655	0.000
P8	0.011	2	1.073	27	0.011	0.990
P9	19.063	2	0.218	27	87.494	0.000
P10	14.659	2	0.548	27	26.731	0.000
P11	3.071	2	0.810	27	3.791	0.035
P12	27.412	2	0.028	27	979.747	0.000
P13	22.291	2	0.179	27	124.615	0.000
P14	9.891	2	0.589	27	16.789	0.000
P15	20.924	2	0.071	27	294.702	0.000
P16	16.634	2	0.496	27	33.563	0.000
P17	0.001	2	1.074	27	0.001	0.999
P18	15.673	2	0.471	27	33.262	0.000
P19	4.737	2	0.731	27	6.484	0.005
P20	11.782	2	0.572	27	20.612	0.000
P21	17.888	2	0.404	27	44.307	0.000
P22	0.372	2	1.046	27	0.356	0.704
P23	0.960	2	1.003	27	0.957	0.396
P24	9.639	2	0.607	27	15.873	0.000
P25	10.271	2	0.560	27	18.333	0.000
P26	28.714	2	0.013	27	2216.797	0.000
P27	11.594	2	0.586	27	19.785	0.000
P28	0.104	2	1.067	27	0.097	0.908
P29	0.029	2	1.072	27	0.027	0.973

Distances between Final Cluster Centers				
Cluster	1	2	3	4
1	—	4.782	10.57	5.729
2	4.782	—	11.739	8.022
3	10.570	11.739	—	11.521
4	5.729	8.022	11.521	—

## K-Means Clustering (K=4)

State	Cluster	Distance
Andhra Pradesh	1	3.056
Arunachal Pradesh	2	5.175
Assam	4	3.198
Bihar	1	3.460
Chhattisgarh	1	3.021
Delhi	3	0.000
Goa	1	4.509
Gujarat	1	3.035
Haryana	2	2.949
Himachal Pradesh	1	3.161
Jammu & Kashmir	1	3.150
Jharkhand	4	2.590
Karnataka	1	3.340
Kerala	1	3.445
Madhya Pradesh	1	2.443
Maharashtra	1	5.583
Manipur	2	2.914
Meghalaya	2	2.634
Mizoram	2	5.709
Nagaland	2	3.501
Odisha	4	5.006
Punjab	1	3.045
Rajasthan	1	2.015
Sikkim	2	4.464
Tamil Nadu	1	3.737
Telangana	1	4.206
Tripura	2	4.065
Uttar Pradesh	1	5.679
Uttarakhand	1	3.241

## K-Means Clustering (K=4)

Final Cluster Centers				
Parameter	Cluster 1	Cluster 2	Cluster 3	Cluster 4
P1	0.0464	0.056	-0.385	-0.109
P2	-0.6226	1.707	-0.710	2.373
P3	3.8372	-0.834	2.137	-0.402
P4	1.1518	-1.105	0.418	0.763
P5	1.0809	-0.410	3.351	-0.543
P6	-0.4783	2.483	-0.825	-0.249
P7	-0.2572	5.194	-0.264	-0.237
P8	-0.4733	-0.315	-0.243	-0.418
P9	0.0275	-0.732	-0.831	0.314
P10	1.8591	-1.063	-0.264	0.029
P11	-0.4909	0.701	-0.837	-0.022
P12	0.6823	-0.295	4.742	-0.406
P13	-0.6346	2.236	2.621	-0.784
P14	0.3856	-0.183	1.927	-0.841
P15	-0.1865	-0.655	4.144	-0.202
P16	1.3424	-0.883	-0.486	-0.051
P17	-0.0027	-0.009	-0.009	0.007
P18	0.8671	-1.959	-0.696	0.458
P19	-0.5671	1.253	0.242	-0.203
P20	3.3727	-0.774	1.574	-0.362
P21	0.5839	-0.568	4.261	-0.334
P22	1.0637	-0.650	0.099	1.621
P23	0.5072	0.180	-0.120	-0.016
P24	0.7357	-0.520	1.516	-0.365
P25	-0.5281	2.584	-0.564	-0.242
P26	0.4742	-0.497	4.937	-0.445
P27	-0.011	1.969	1.047	-0.639
P28	-0.0763	-0.248	-0.248	5.143
P29	-0.0545	-0.177	-0.177	3.673

Iteration History				
Iteration	Cluster 1	Cluster 2	Cluster 3	Cluster 4
1	5.308	5.917	0.000	4.525
2	0.367	0.166	0.000	0.798
3	0.149	0.000	0.000	0.228
4	0.000	0.000	0.000	0

## K-Means Clustering (K=4)

ANOVA						
Parameter	Cluster Mean Square	df	Error Mean Square	df	F	Sig.
P1	0.648	3	1.033	26	0.627	0.605
P2	15.376	3	0.302	26	50.951	0.000
P3	17.035	3	0.386	26	44.119	0.000
P4	2.176	3	0.949	26	2.292	0.101
P5	5.529	3	0.626	26	8.832	0.000
P6	9.374	3	0.251	26	37.312	0.000
P7	9.628	3	0.219	26	43.910	0.000
P8	0.089	3	1.090	26	0.082	0.969
P9	9.748	3	0.871	26	11.193	0.000
P10	8.631	3	0.933	26	9.248	0.000
P11	2.254	3	0.843	26	2.674	0.068
P12	11.803	3	0.573	26	20.588	0.000
P13	15.663	3	0.432	26	36.237	0.000
P14	8.573	3	0.687	26	12.488	0.000
P15	13.606	3	0.627	26	21.707	0.000
P16	7.638	3	0.917	26	8.331	0.001
P17	0.001	3	1.115	26	0.001	1.000
P18	8.379	3	0.824	26	10.164	0.000
P19	2.859	3	0.861	26	3.321	0.036
P20	13.540	3	0.412	26	32.874	0.000
P21	10.236	3	1.037	26	9.873	0.000
P22	3.340	3	0.848	26	3.937	0.019
P23	0.396	3	1.056	26	0.375	0.772
P24	5.512	3	1.063	26	5.185	0.006
P25	7.460	3	0.839	26	8.893	0.000
P26	11.644	3	0.599	26	19.453	0.000
P27	8.493	3	0.945	26	8.991	0.000
P28	9.757	3	0.246	26	39.658	0.000
P29	5.185	3	0.635	26	8.168	0.001

Distances between Final Cluster Centers				
Cluster	1	2	3	4
1	—	4.782	10.57	5.729
2	4.782	—	11.739	8.022
3	10.570	11.739	—	11.521
4	5.729	8.022	11.521	—

## K-Means Clustering (K=5)

Cluser Membership		
State	Cluster	Distance
Andhra Pradesh	2	3.732
Arunachal Pradesh	2	6.430
Assam	2	2.024
Bihar	2	3.242
Chhattisgarh	2	2.689
Delhi	3	0.000
Goa	2	3.954
Gujarat	1	2.954
Haryana	1	3.141
Himachal Pradesh	2	2.244
Jammu & Kashmir	2	2.283
Jharkhand	2	2.633
Karnataka	1	1.654
Kerala	2	3.433
Madhya Pradesh	2	2.942
Maharashtra	1	3.658
Manipur	2	4.089
Meghalaya	2	2.736
Mizoram	5	0.000
Nagaland	2	4.730
Odisha	4	0.000
Punjab	2	3.068
Rajasthan	2	2.902
Sikkim	2	4.919
Tamil Nadu	1	3.143
Telangana	1	4.260
Tripura	2	3.384
Uttar Pradesh	1	5.029
Uttarakhand	2	2.915
West Bengal	2	3.740

## K-Means Clustering (K=5)

Final Cluster Centers					
Parameter	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
P1	0.0464	0.4536	-0.385	-0.109	0.056
P2	-0.6226	-0.67	-0.710	2.373	1.707
P3	3.8372	-0.8224	2.137	-0.402	-0.834
P4	1.1518	-1.1003	0.418	0.763	-1.105
P5	1.0809	-0.6299	3.351	-0.543	-0.410
P6	-0.4783	-0.377	-0.825	-0.249	2.483
P7	-0.2572	-0.264	-0.264	-0.237	5.194
P8	-0.4733	-0.4267	-0.243	-0.418	-0.315
P9	0.0275	-0.6677	-0.831	0.314	-0.732
P10	1.8591	-0.9944	-0.264	0.029	-1.063
P11	-0.4909	0.0726	-0.837	-0.022	0.701
P12	0.6823	-0.475	4.742	-0.406	-0.295
P13	-0.6346	-0.6505	2.621	-0.784	2.236
P14	0.3856	-1.0494	1.927	-0.841	-0.183
P15	-0.1865	1.5656	4.144	-0.202	-0.655
P16	1.3424	-0.8048	-0.486	-0.051	-0.883
P17	-0.0027	0.0039	-0.009	0.007	-0.009
P18	0.8671	-1.4059	-0.696	0.458	-1.959
P19	-0.5671	-1.1322	0.242	-0.203	1.253
P20	3.3727	-0.7563	1.574	-0.362	-0.774
P21	0.5839	-0.4169	4.261	-0.334	-0.568
P22	1.0637	-0.6381	0.099	1.621	-0.650
P23	0.5072	0.4955	-0.120	-0.016	0.180
P24	0.7357	-0.1441	1.516	-0.365	-0.520
P25	-0.5281	0.3612	-0.564	-0.242	2.584
P26	0.4742	-0.4801	4.937	-0.445	-0.497
P27	-0.011	1.1309	1.047	-0.639	1.969
P28	-0.0763	-0.245	-0.248	5.143	-0.248
P29	-0.0545	-0.175	-0.177	3.673	-0.177

Iteration History					
Iteration	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
1	5.308	4.910	0.000	0.000	0.000
2	0.367	0.383	0.000	0.000	0.000
3	0.149	0.121	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000

## K-Means Clustering (K=5)

ANOVA						
Parameter	Cluster Mean Square	df	Error Mean Square	df	F	Sig.
P1	0.780	4	1.023	25	0.763	0.560
P2	10.729	4	0.462	25	23.245	0.000
P3	12.506	4	0.444	25	28.192	0.000
P4	1.645	4	1.006	25	1.636	0.196
P5	4.318	4	0.673	25	6.419	0.001
P6	7.071	4	0.428	25	16.520	0.000
P7	7.254	4	0.384	25	18.899	0.000
P8	0.076	4	1.115	25	0.068	0.991
P9	7.503	4	0.986	25	7.611	0.000
P10	6.547	4	1.041	25	6.289	0.001
P11	1.799	4	0.908	25	1.981	0.129
P12	8.983	4	0.718	25	12.515	0.000
P13	10.742	4	0.606	25	17.731	0.000
P14	6.387	4	0.834	25	7.661	0.000
P15	10.503	4	0.692	25	15.177	0.000
P16	5.777	4	1.009	25	5.724	0.002
P17	0.001	4	1.154	25	0.001	1.000
P18	6.042	4	0.994	25	6.078	0.001
P19	3.488	4	0.811	25	4.301	0.008
P20	9.866	4	0.615	25	16.035	0.000
P21	8.111	4	1.181	25	6.870	0.001
P22	2.512	4	0.917	25	2.739	0.052
P23	0.398	4	1.094	25	0.364	0.833
P24	4.365	4	1.143	25	3.818	0.015
P25	5.542	4	0.997	25	5.560	0.003
P26	8.730	4	0.770	25	11.337	0.000
P27	6.623	4	1.109	25	5.971	0.002
P28	7.501	4	0.403	25	18.615	0.000
P29	4.012	4	0.846	25	4.742	0.005

Distances between Final Cluster Centers					
Cluster	1	2	3	4	5
1	—	4.532	10.57	5.729	4.782
2	4.532	—	10.932	6.891	4.248
3	10.570	10.932	—	11.521	11.739
4	5.729	6.891	11.521	—	8.022
5	4.782	4.248	11.739	8.022	—

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