



Global Research Performance Analytics

A Strategic Diagnostic of Research Metrics & India's Position

Context: Hiring Assessment for Project Intern | PAIU-
OPSA, IISc Bangalore

Presented By: Omkar Sharma (*Data Analytics
Enthusiast*)

Objective: Moving beyond basic reporting to identify
the hidden drivers of research excellence.

ETL & Analytical Approach

Ensuring accuracy before analysis.



The Tech Stack

Python (Pandas): For rigorous data cleaning.

Streamlit & Plotly: For interactive, evidence-based storytelling.

Smart Aggregation

Handled duplicate yearly records for the same countries.

Logic: Summed Quantitative metrics (Volume) but Averaged Qualitative metrics (CNCI).

Entity Resolution (Crucial Fix)

Identified that 'United Kingdom' and 'England' were listed as separate entities.

Action: Aggregated them to ensure accurate global ranking.

The Elite Club & Strategic Models

Understanding the Global Landscape.

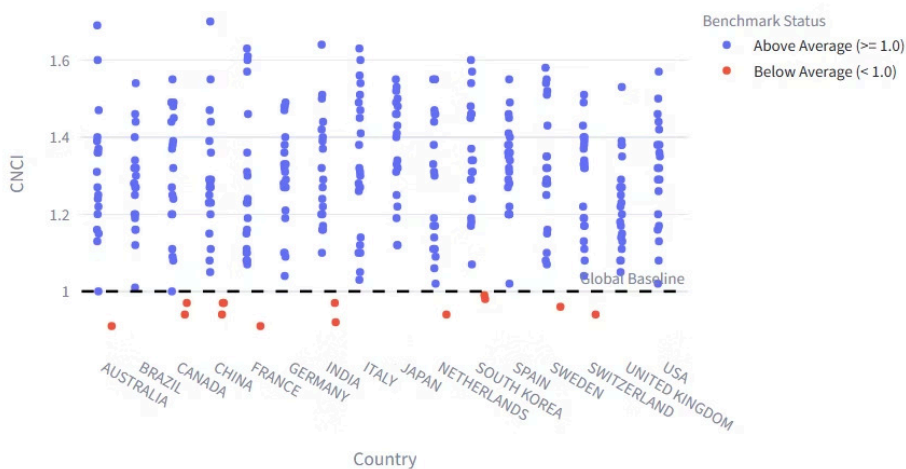
Insight 1: Decentralized Power

- **Pareto Principle Fails:** It takes **75% of nations** to generate 80% of total impact. Research power is distributed, not monopolized.
- **High Performance Norm:** CNCI > 1.0 is the standard, not the exception.

1. Consistency Check (Granular View)

Rare Failures (Years < 1.0)
14 / 340 Years
↑ Anomalies

Granular Check: Structural Strength vs Occasional Dips

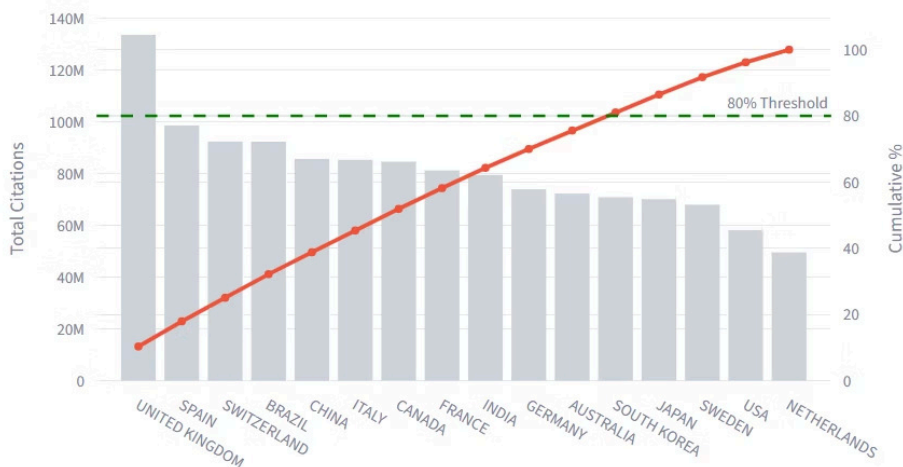


Note: Each dot is a specific Year. While every country passes on average, the red dots show rare years where they slipped.

2. Power Concentration (Pareto)

Entities needed for 80% Impact
75.0%
↑ Pareto Principle Failed

Lorenz Curve: Impact is Distributed, Not Monopolized

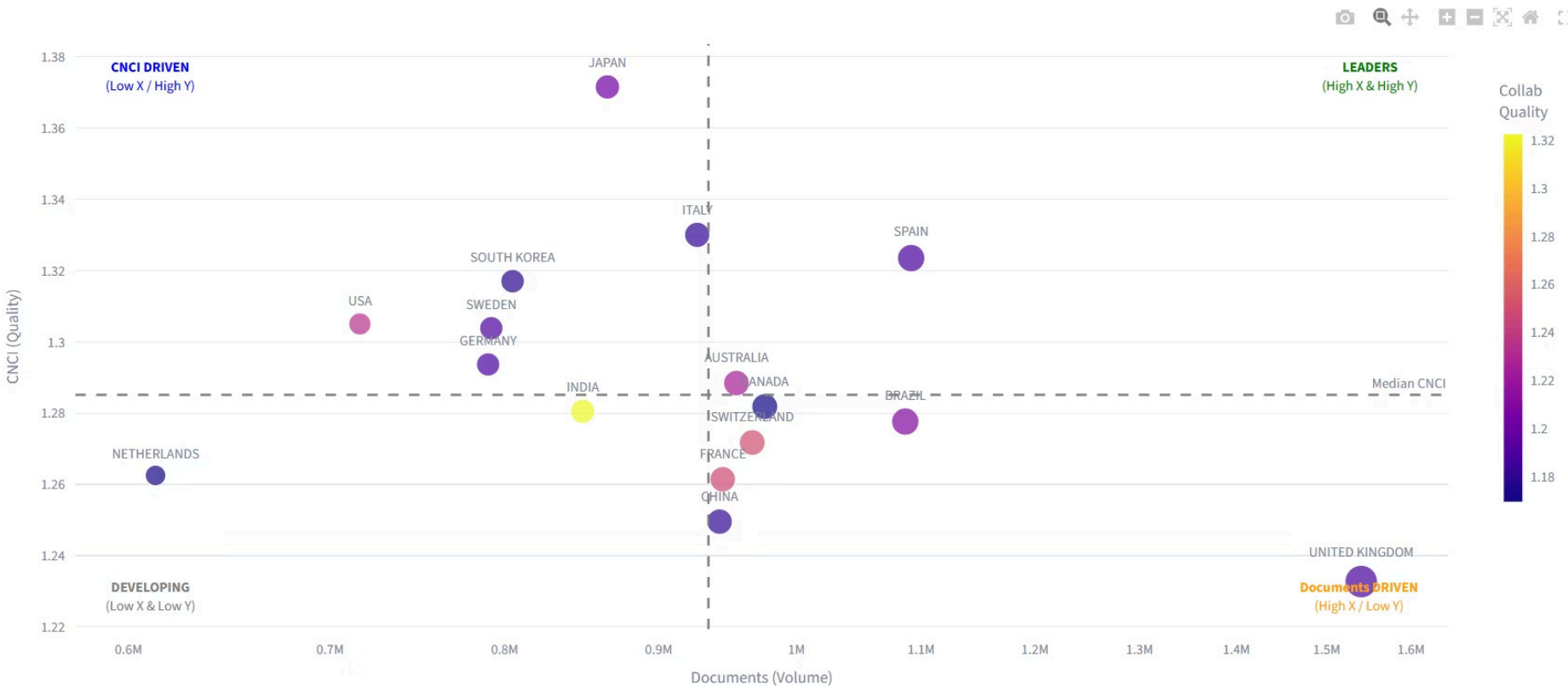


Note: The curve is flat, meaning research power is shared among many nations, not hoarded by just one.

Insight 2: Strategic Divergence (The 4 Models)

- **Mass Producer:** UK (High Volume, Lower Quality).
- **Boutique Specialist:** Japan (High Quality, Lower Volume).
- **Elite Performer:** Spain (Ideally balances both).
- **India Lens:** Currently in the 'Catch-up Zone' but sits critically close to the **Global Median**, signaling a transition phase towards the Elite Club.


Strategic Position : Documents (Volume) vs CNCI (Quality)



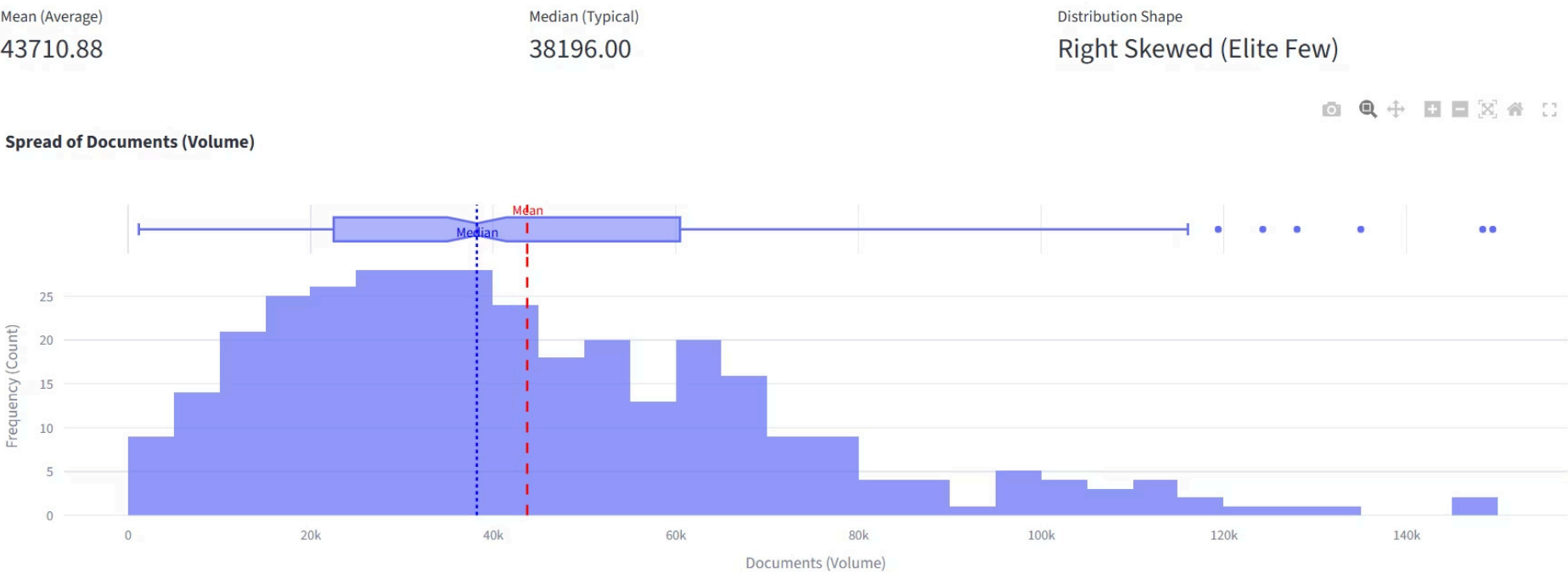
Elite Output & Competitive Trends

Where do we stand in the race?


Insight 3: Distribution Analysis

- Symmetry:** Quality follows a Bell Curve (Shared Standard), while Volume and Times Cited are skewed (Outliers).
-  **India Lens:** Surprisingly, **India ranks 9th** in producing Top 1% Blockbuster papers, outperforming the **USA (#10)**.

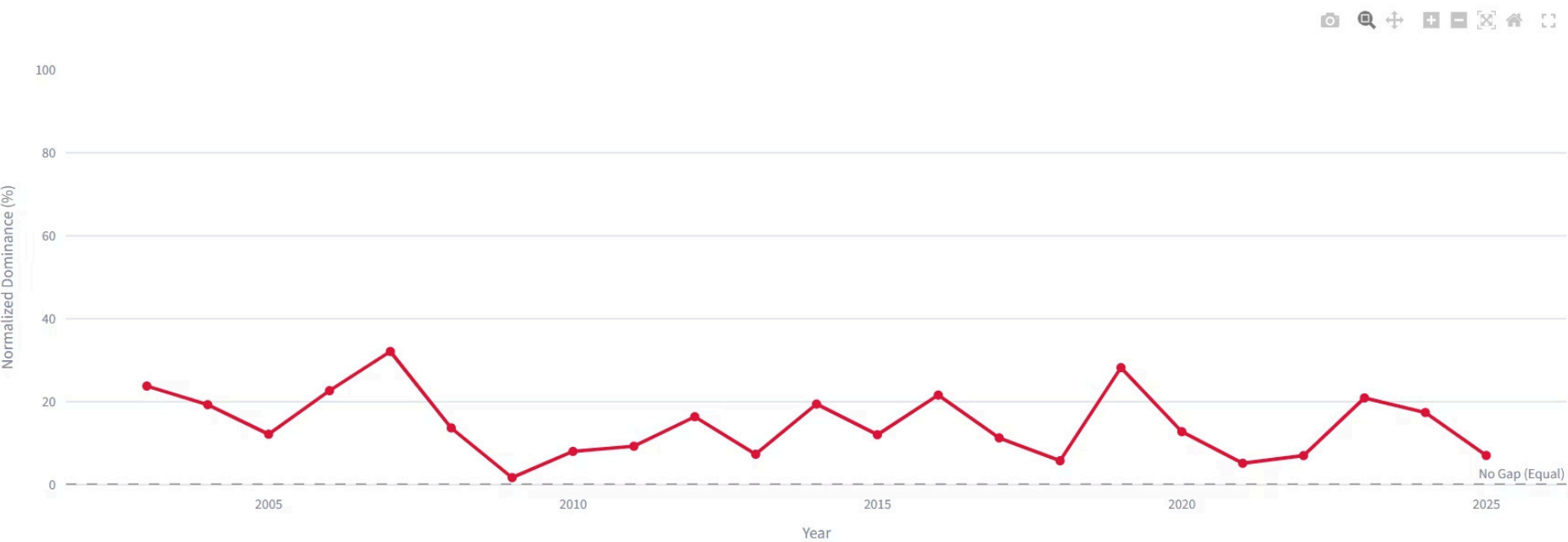
Distribution of Documents (Volume)



Insight 4: Competitive Analysis

- Trend:** The dominance gaps between Market Leaders and Runners-up are shrinking.
-  **India Lens:** India emerged as the direct **Runner-up** to Spain in total citations, proving its status as a rising **Competitive Challenger**.

1. Market View: Leader's Dominance - Top 2 by Times Cited (Impact)



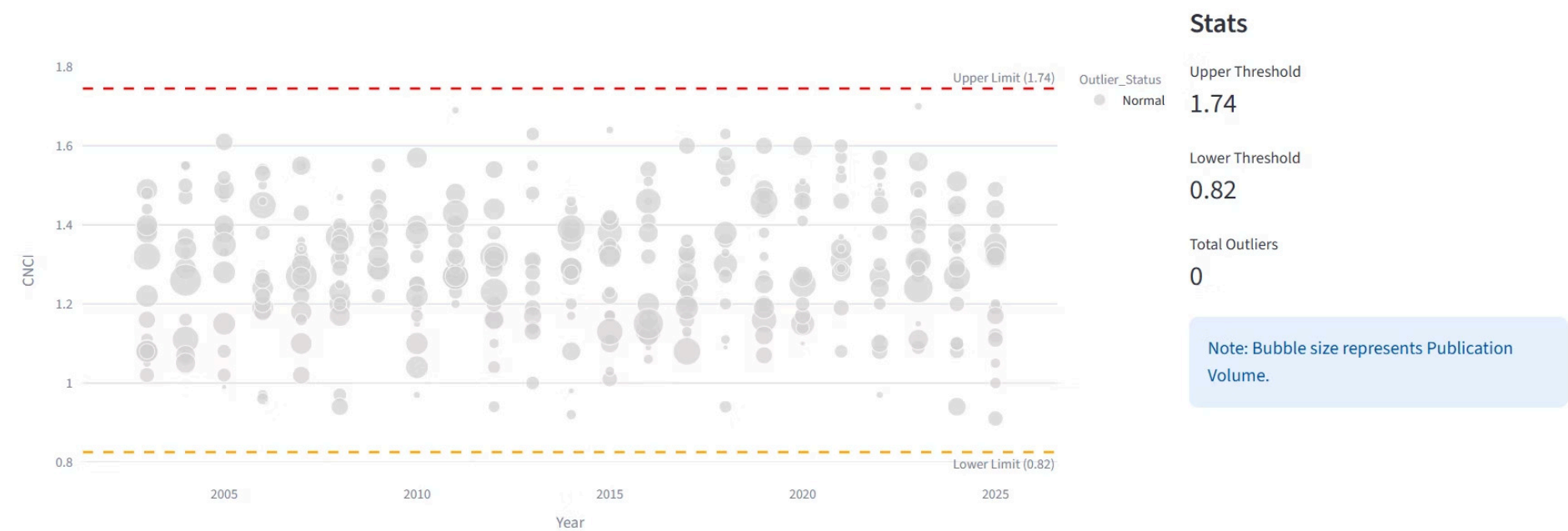
The Quality Ceiling & Collaboration Myth

Dispelling common assumptions with data.


Insight 5: The Quality Ceiling

- **Volume Spikes:** Countries like China and Italy show massive outliers in quantity.
- **Quality Ceiling:** However, **Quality (CNCI)** has **Zero Outliers**. Excellence cannot be mechanically scaled; it hits a natural ceiling.

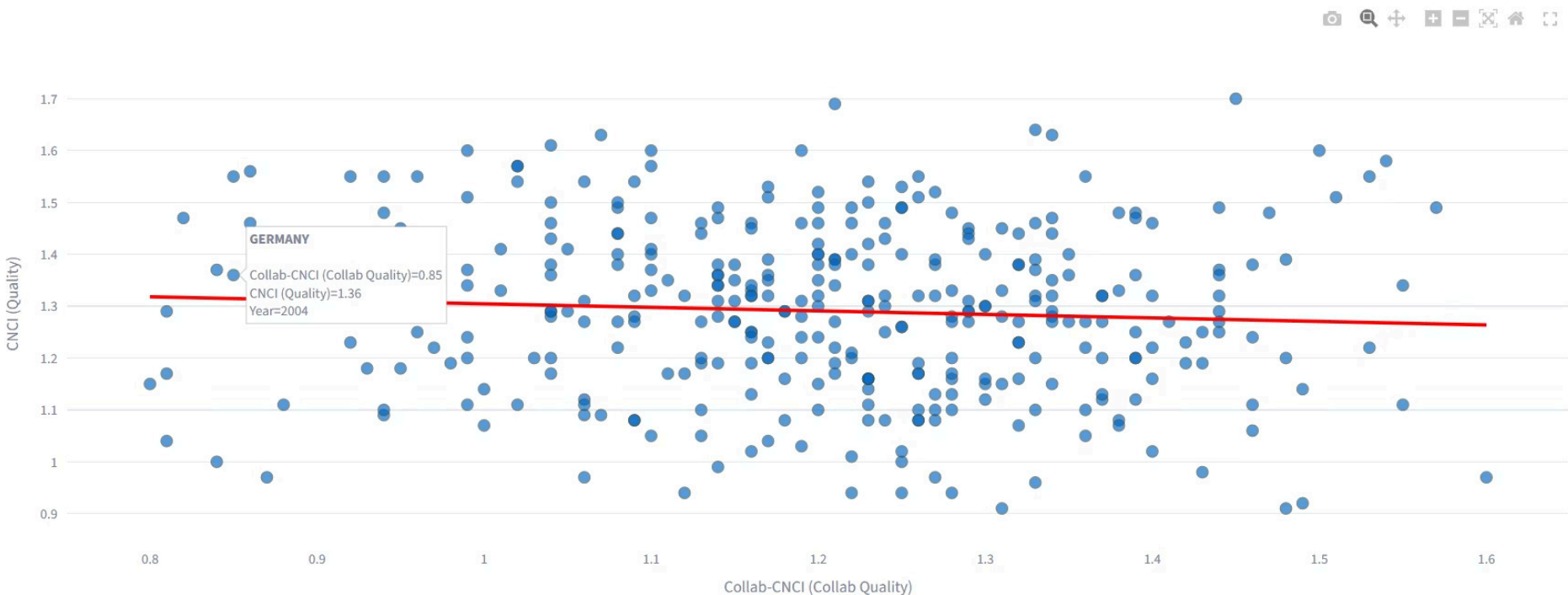
Anomaly Detection in CNCI (Quality)



Insight 6: The Collaboration Myth (Critical)

- **Data:** There is **Zero Linear Correlation** between Collaboration Quality and Elite Output.
- **Conclusion:** Collaboration is a **"Hygiene Factor,"** not a differentiator.
-  **India Proof:** India ranks **#1 Globally** in Collaboration Quality, yet has an efficiency gap in converting it to elite research.

Correlation Analysis - Collab-CNCI (Collab Quality) vs CNCI (Quality)



Global Performance Leaderboard

Who leads the race?

Insight 7: No Single Winner



Volume Leader
United Kingdom (#1)



Quality Leader (CNCI)
Japan (#1)



Elite Impact Leader
Sweden (#1)

India's Balanced Profile:



- Rank # 9
in Elite Impact
- Rank # 10
in Quality
- Rank # 11
in Volume

👍 **Conclusion:** India is not an outsider but a core competitor with a balanced growth profile.

Roadmap for India: From Volume to Value

Policy recommendations based on evidence.



Shift from Volume to Value

Problem: 'Getting cited' is just a baseline.

Action: Stop rewarding total paper counts. Prioritize Top 1% Output (High-Risk, High-Reward Research).

Fix the Efficiency Gap

Problem: High collaboration score (#1) but average elite conversion.

Action: Conduct a "Collaboration Audit" to translate existing partnerships into elite outcomes.

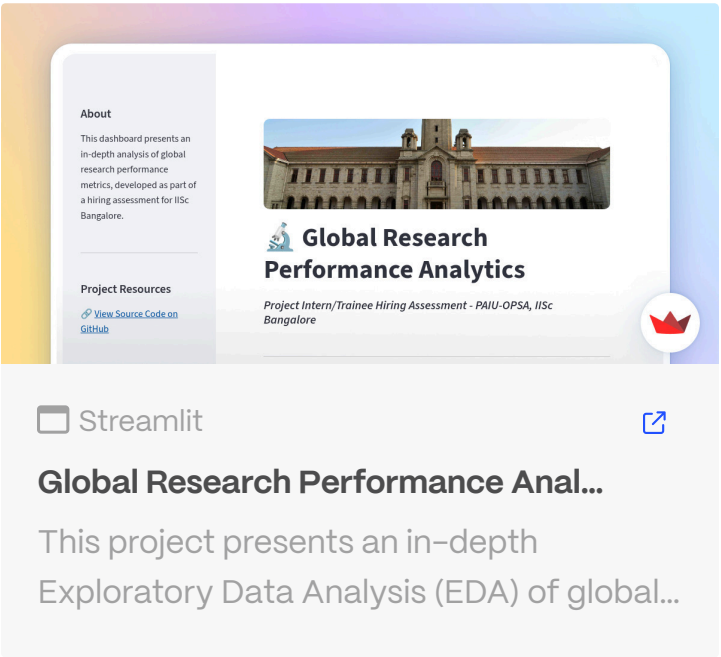
Target the 'Elite Quadrant'

Problem: India is near the median line.

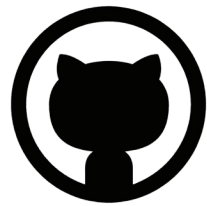
Action: Adopt the 'Spain Model' (Balanced Growth) to cross into the Elite Club within 5 years.

Thank You!

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