



# 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.

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### 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.

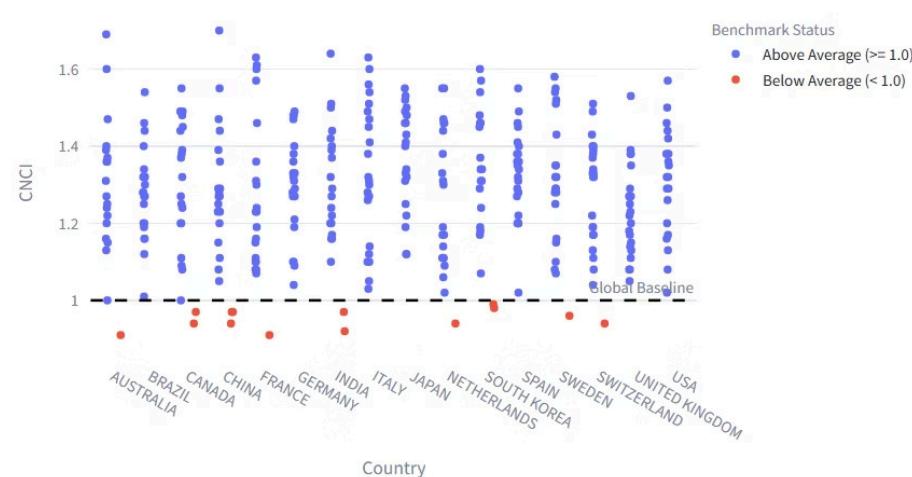
## Insight 1: Decentralized Power

- 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

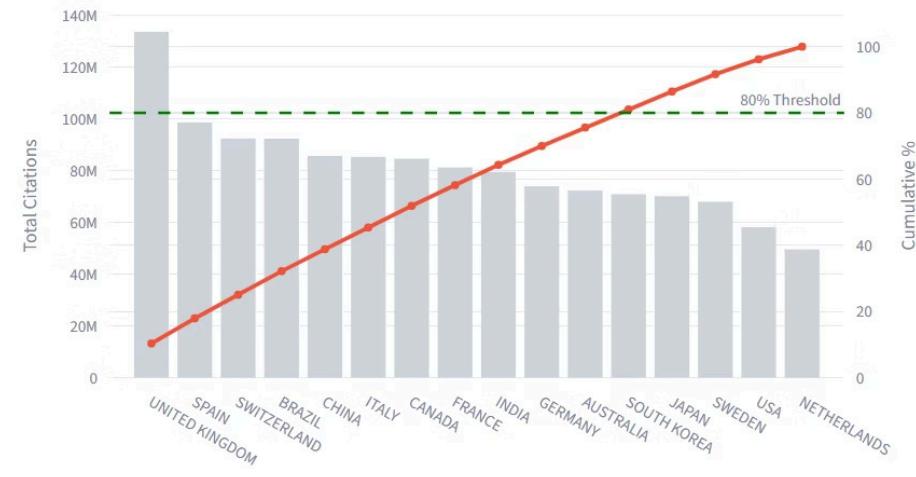


Note: Each dot is a specific Year. While every country passes on average, the red dots show rare years where they slipped.

### 2. Power Concentration (Pareto)

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

Lorenz Curve: Impact is Distributed, Not Monopolized

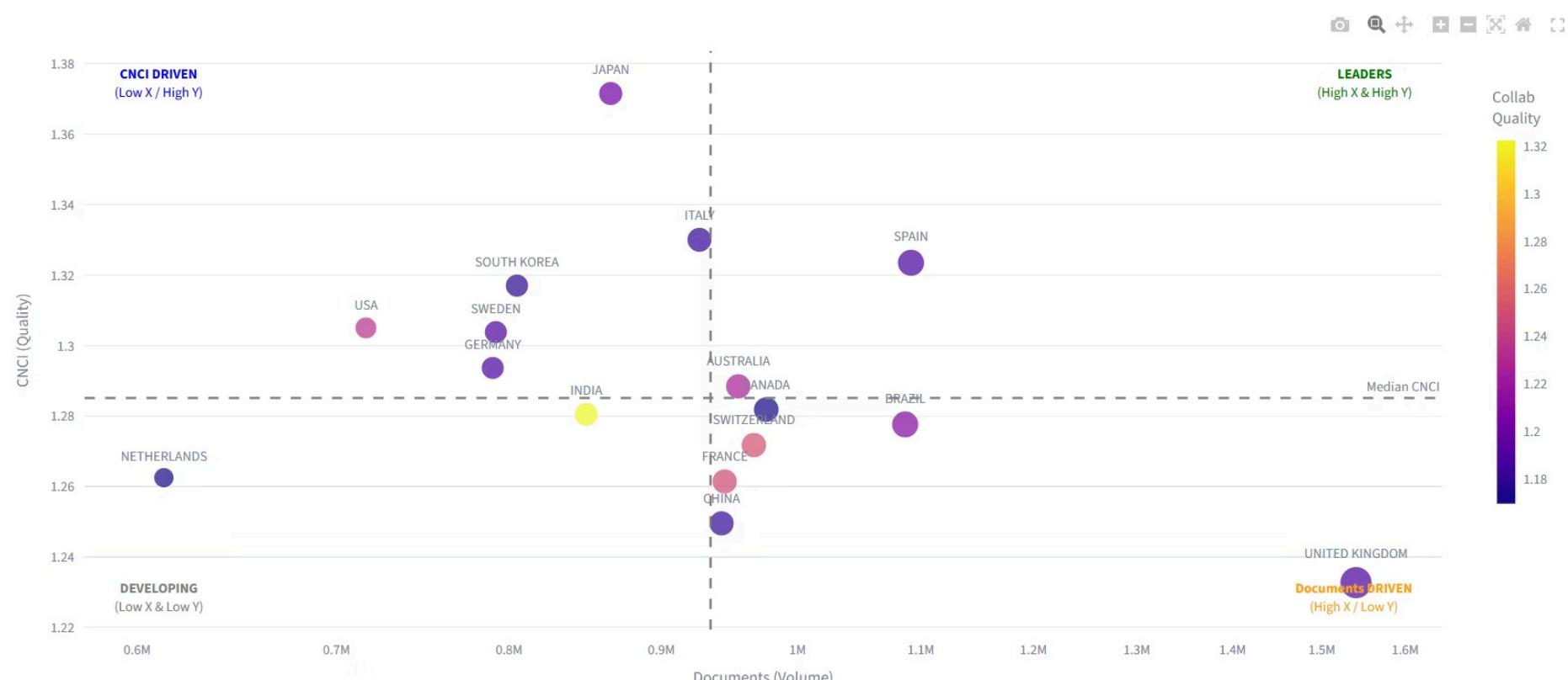


Note: The curve is flat, meaning research power is shared among many nations, not hoarded by just one.

## 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)

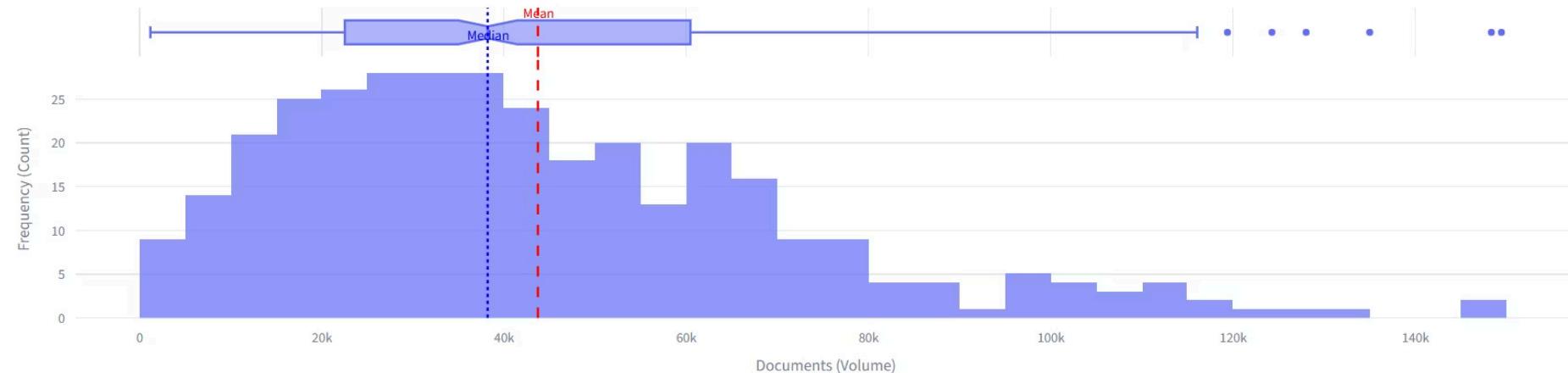
Mean (Average)  
43710.88

Median (Typical)  
38196.00

Distribution Shape  
Right Skewed (Elite Few)



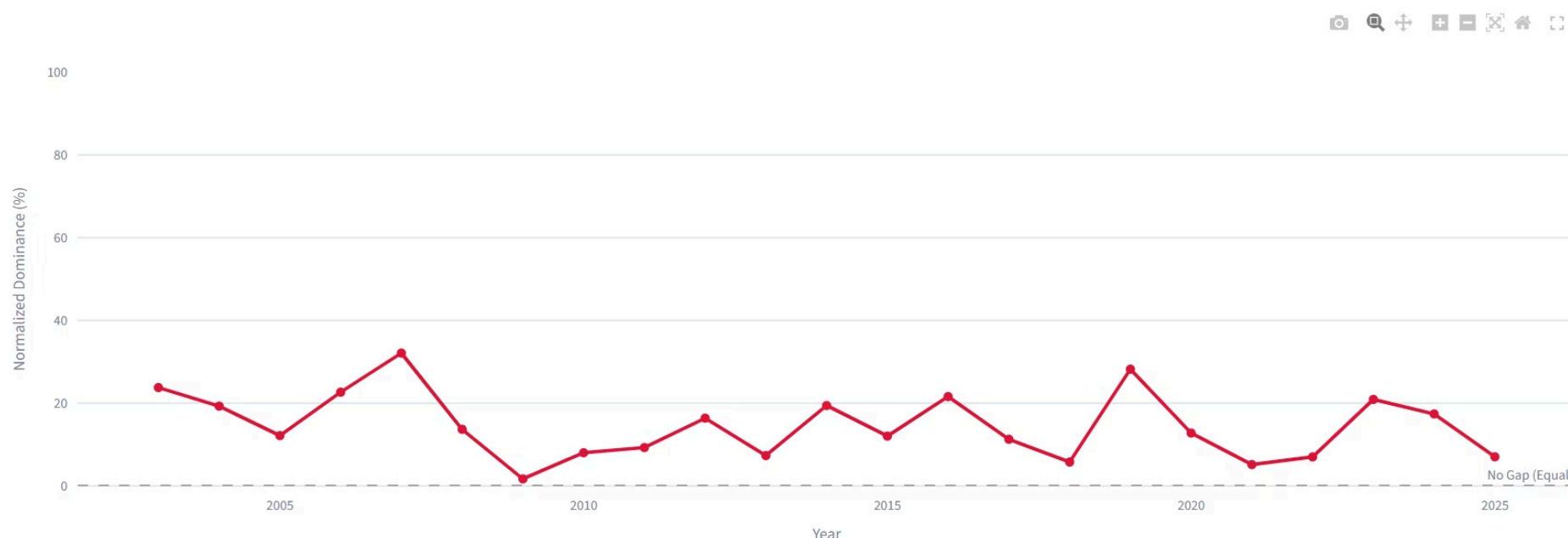
Spread of Documents (Volume)



## 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)



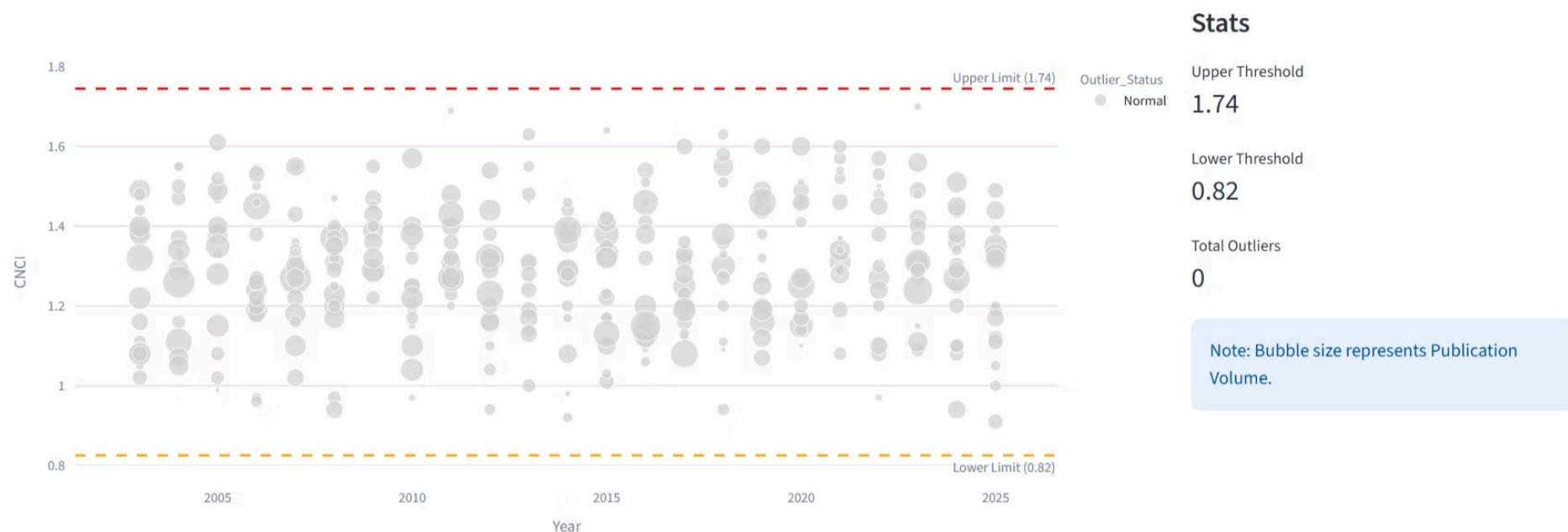
# The Quality Ceiling & Collaboration Myth

*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.

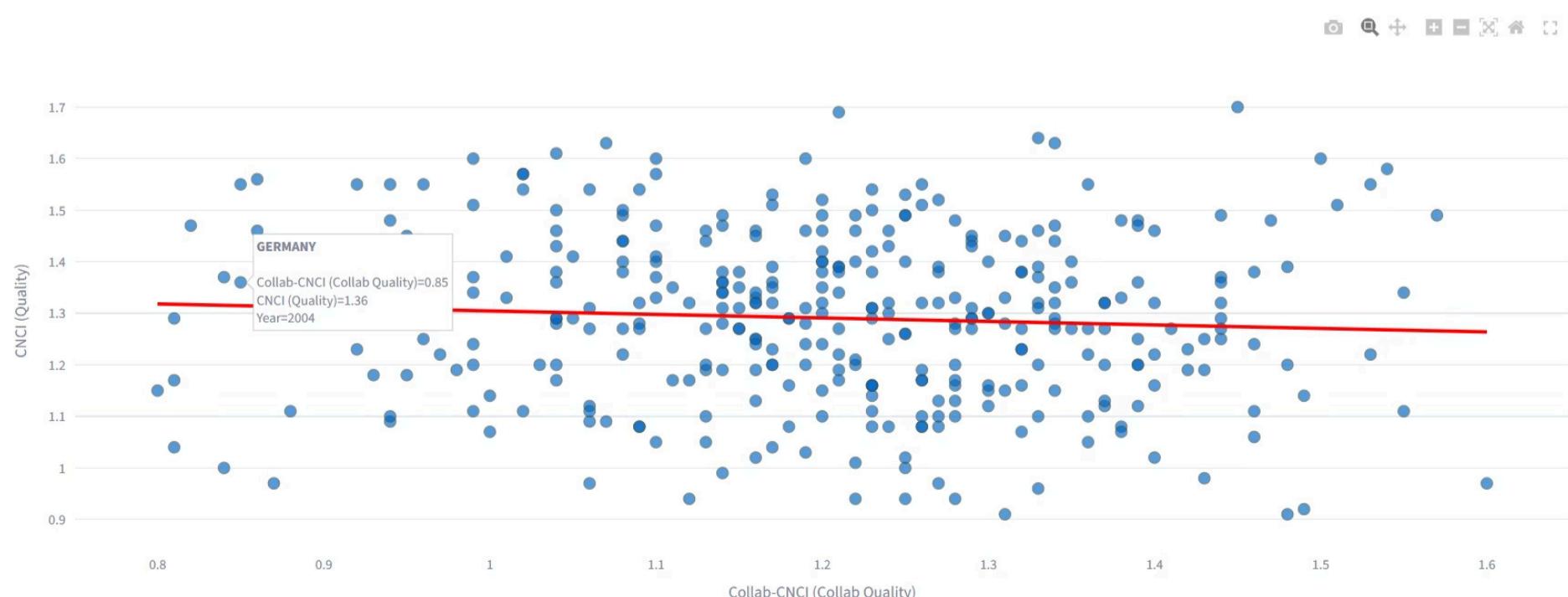
Anomaly Detection in CNCI (Quality)



## 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!

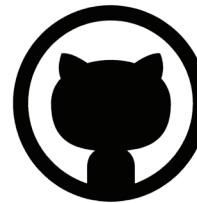
Scan for Live Dashboard



A screenshot of a Streamlit dashboard titled "Global Research Performance Analytics". The dashboard has a light blue header with a colorful gradient. On the left, there's a sidebar with sections for "About" and "Project Resources" (with a link to "View Source Code on GitHub"). The main content area features a photograph of a large, classical-style building, the title "Global Research Performance Analytics", and a subtitle "Project Intern/Trainee Hiring Assessment - PAIU-OPSA, IISc Bangalore". A small red crown icon is in the bottom right corner of the main content area. Below the dashboard, there's a snippet of text: "Streamlit" followed by "Global Research Performance Anal..." and "This project presents an in-depth Exploratory Data Analysis (EDA) of global...".



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