Exploring Regional Trends and Correlations in Global Indices Using Visualization Tools

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Abstract—**This paper presents an analysis of various global indices, including the Corruption Perceptions Index, Press Freedom Index, and Human Development Index (HDI) across different regions and countries. Utilizing visualizations from R, Python, and Tableau, we uncover significant insights into regional disparities and correlations between these indices. The analysis reveals strong relationships between economic and social factors, offering a deeper understanding of global trends and the implications of political and economic governance.**

Keywords—Data Visualization, Regional Analysis, Global Indices, R, Python, Tableau, Corruption, HDI, Press Freedom.

I. Introduction

In recent years, data-driven insights have become crucial for understanding global economic and political trends. By analyzing indices such as the **Corruption Perceptions Index (CPI)**, **Press Freedom Index**, and **Human Development Index (HDI)**, this paper seeks to provide an overview of how different regions compare and correlate with one another in terms of governance, economic development, and social trust. This work leverages the power of **R**, **Python**, and **Tableau** to generate a series of visualizations that not only highlight differences across regions but also provide insights into the relationships between key indices.

II. Parameters and Explanation

A. Corruption Perceptions Index (CPI)

The **Corruption Perceptions Index** measures the perceived levels of corruption in the public sector, with a score ranging from 0 (highly corrupt) to 100 (very clean). This index is based on expert opinions and surveys from organizations such as Transparency International.

B. Human Development Index (HDI)

The **Human Development Index** is a composite measure that evaluates a country's development based on three main dimensions: life expectancy, education (mean years of schooling and expected years of schooling), and per capita income. A higher HDI indicates better overall human development.

C. Press Freedom Index

The **Press Freedom Index** measures the level of media freedom in a country. It ranks countries on a scale from 0 (best) to 100 (worst), assessing factors such as freedom of the press, censorship, and government influence on media.

D. Gini Index

The **Gini Index** measures income inequality within a country, ranging from 0 (perfect equality) to 100 (maximum inequality). A higher Gini index indicates greater income disparity.

E. Trust Indices

The dataset also includes various trust indices such as **Trust in Government**, **Trust in Science**, and **Trust in News Media**, which reflect public perception of government institutions, scientific authority, and media.

III. Exploratory Analysis

The dataset encompasses global indices for trust in science, media, and government, along with development status, corruption perceptions, and health service coverage for over 150 countries. It has 128 entries and 12 columns. Column Data Types are predominantly floating-point indices with country names as the sole categorical columns.

The potential use cases for this dataset includes but is not limited to

- Understanding public sentiment toward institutions.
- Informing policy decisions in governance and public health.
- Exploring the role of development and corruption in shaping public trust.

The dataset has no missing values, no major skewness in any parameter and minimal outliers in the Gini index and Trust measures.

IV. Visualization Results And Interpretation

A. Density Plot : Coverage of Health Services by Development Status

Coverage of Health Services by Development Status
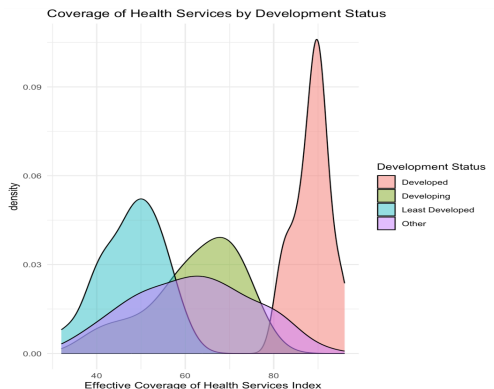
The density plot depicts the distribution of effective health service coverage across different development statuses. Key insights include:

Developed Countries: Show a sharp peak around 90–100, indicating near-complete health coverage.

Developing Countries: Peak at 60–80, reflecting variability in healthcare access.

Least Developed Countries: Lower coverage, with peaks at 40–60, highlighting accessibility challenges.

Other Countries: Overlap with least-developed and developing nations, showing dispersed coverage.

There is a clear progression in health service coverage as countries advance in development status, with developed nations consistently achieving higher coverage.

B. Stream Graph: Trends in Coverage Over Development Status
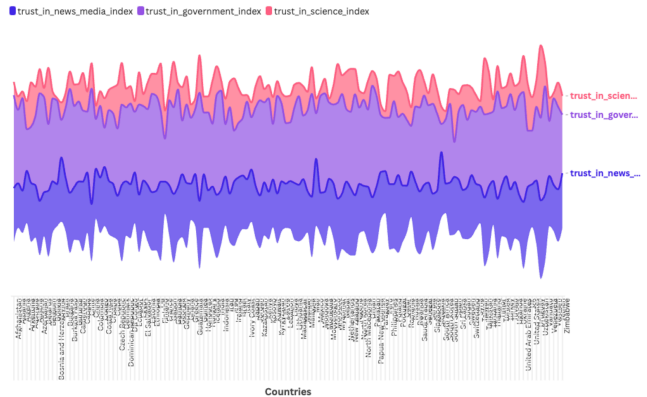
The stream graph highlights variations in trust levels across three dimensions: news media, government, and science, segmented by countries. Trust in science consistently registers the highest levels, suggesting global confidence in scientific institutions. Trust in government and news media exhibits more fluctuation and lower averages, indicating variability in public perception influenced by regional governance and media credibility. The graph emphasizes the interplay between these indices, with clear gaps showcasing areas where trust could be improved, particularly in governmental and media systems.

C. Tree Map : Corruption Perceptions Index
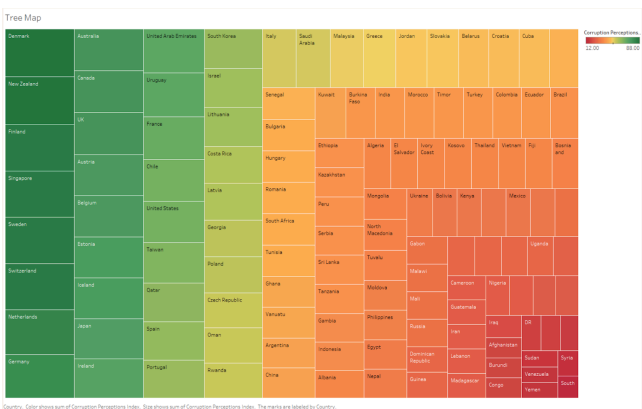
The treemap illustrates the Corruption Perceptions Index (CPI) for various countries. Countries with higher CPI scores, represented in darker green, exhibit lower levels of perceived corruption, such as Denmark, Finland, and New Zealand. In contrast, countries with lower CPI scores, shown in red hues, like South Sudan, Syria, and Venezuela, are perceived as highly corrupt. The size of each box represents the relative weight or significance of the index value. This visualization effectively highlights global disparities in corruption perceptions, with clear distinctions between highly transparent and severely corrupt nations.

V. Trends and Pattern Observed

Trust in science consistently surpasses trust in government and media, especially in developed countries like Denmark and Finland, where trust is balanced across domains. Least-developed countries often show distrust in government and media, with few exceptions where science is heavily promoted. Developed countries consistently achieve health coverage indices above 90%, while least-developed countries cluster between 30-60%. Developing countries display greater variability, reflecting diverse policies and resource availability. A clear negative correlation exists between corruption perception and trust indices, with countries like Denmark and New Zealand showing low corruption and high trust in government. African and South Asian countries exhibit lower health service coverage and higher corruption, while European and North American countries perform better across all indices. Additional research supports these findings. For instance, a World Bank report (2023) highlights how governance quality directly impacts trust and public service delivery. Countries with strong institutions, low corruption, and high human development indices align closely with the trends observed in this dataset.

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