# Data Visualization

ISM6419.792U24 Summer 2024

Prof. Johannes Reichgelt

Project Report on

Global Development Indicators: Analyzing Trends and Correlations Across Countries

By

Anoop Garige

U52055358

MS in Business Analytics and Information Systems

# Introduction

Global development encompasses a myriad of factors, ranging from economic and political to social and environmental. Understanding the interplay between these dimensions is crucial for designing policies that foster sustainable growth and improve quality of life worldwide. This project aims to analyze key global development indicators, drawing insights from robust datasets and leveraging advanced visualization tools to uncover significant trends, correlations, and regional disparities.

My motivation for this comprehensive analysis stems from a profound interest in how countries progress and the factors that drive or hinder their development. By examining indicators such as GDP per capita, democratic stability, population growth, migration trends, armed forces personnel, economic growth, and agricultural land distribution, I hope to contribute to the global dialogue on development. The insights garnered from this study can inform policymakers, development agencies, and researchers in their quest to understand development nuances and devise strategies that promote equitable and sustainable growth.

# Methodology

To achieve the objectives of this comprehensive analysis, I employed a meticulous and systematic approach involving several key steps: data collection, cleaning, integration, and visualization. Each step was carefully designed to ensure the accuracy, reliability, and relevance of the findings.

The data for this project was sourced from reputable and authoritative institutions, ensuring a high degree of credibility and robustness. The primary sources of data included:

- **Military Expenditure Data**: Sourced from the Global Health Data Exchange, this dataset provides detailed information on military spending by country, allowing for an analysis of the allocation of resources towards defense and its implications for development.
  - Source: Global Health Data Exchange
- **GDP per Capita Data**: Obtained from the World Bank, this dataset offers comprehensive data on GDP per capita across various countries, serving as a key indicator of economic health and standard of living.
  - Source: World Bank
- **Human Development Index Data**: Provided by Our World in Data, this dataset includes HDI scores, which encompass factors such as life expectancy, education, and income, offering a holistic view of human development.
  - Source: Our World in Data
- **Ranked GMI Data**: From the Bonn International Center for Conflict Studies, this dataset ranks countries based on their militarization levels, providing insights into the balance between military expenditure and development.
  - Source: Bonn International Center for Conflict Studies
- **Stability of Democratic Institutions Data**: Also sourced from Our World in Data, this dataset tracks the stability of democratic institutions across countries, enabling an analysis of political stability and its impact on development.
  - Source: Our World in Data
- **World Population Data**: The World Bank provides this dataset, which includes population figures from 1960 to 2023, facilitating an examination of demographic trends and their implications for development.
  - Source: World Bank
- **World Development Indicators**: A comprehensive set of indicators from the World Bank, this dataset covers various aspects of development, from economic performance to social well-being.
  - Source: World Bank

These datasets were selected for their relevance, coverage, and reliability, forming the foundation of the analysis.

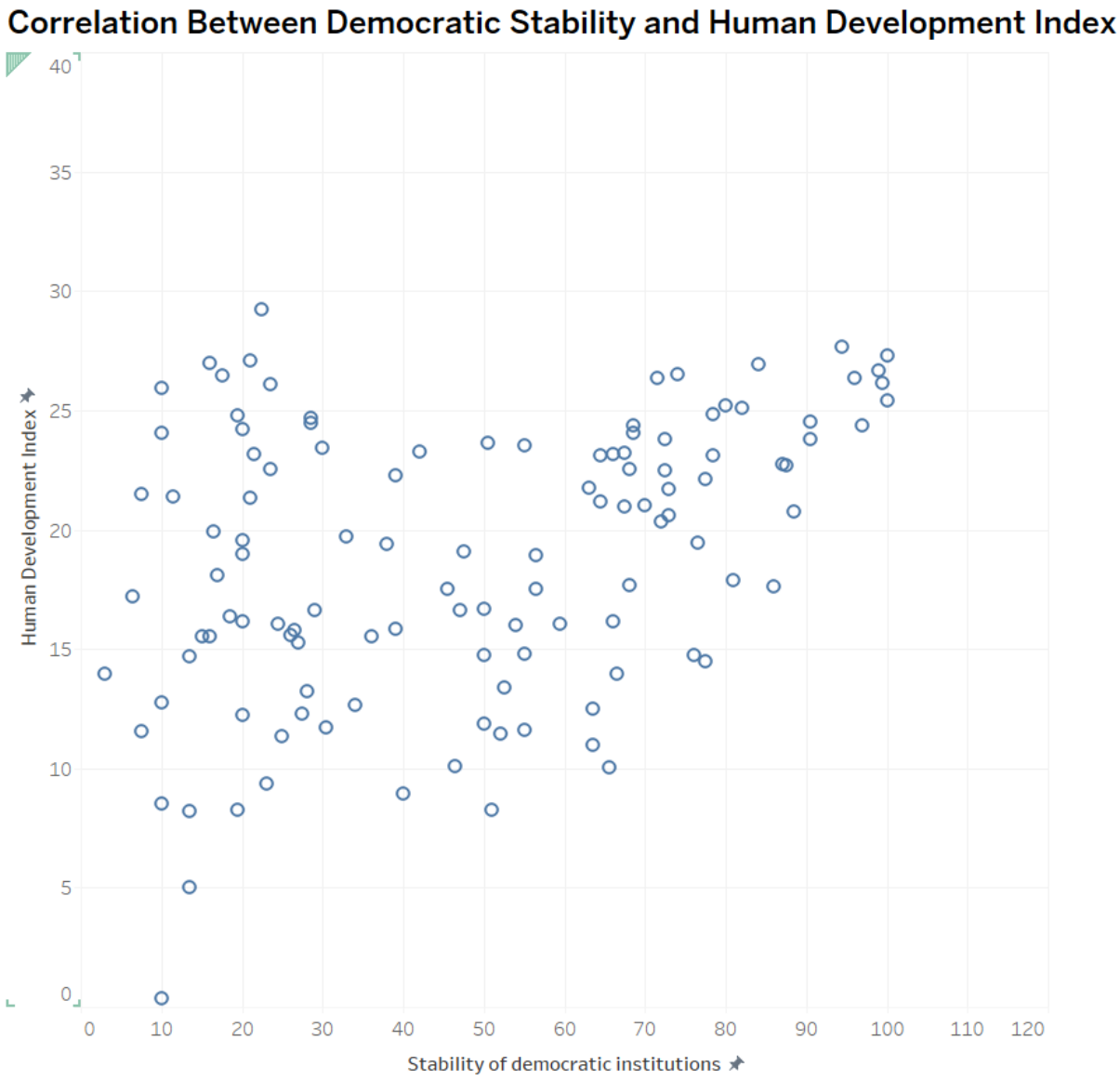
These are the formulated research questions that I am going to answer from my visuals.

1. What is the correlation between democratic stability and human development indicators?
2. What is the trend in different regions around the world in terms of migration?
3. How does population growth impact GDP per capita across various countries?
4. How does democratic stability range over time?
5. What is the distribution of armed forces personnel (as a percentage of total labor force) across different regions?
6. How has the world's GDP per capita changed over the years?
7. How does economic growth (as indicated by GDP per capita) influence fertility rates around the world?
8. How does the distribution of agricultural land vary among the top 10 countries with the largest agricultural land areas?
9. How is the global distribution of permanent cropland (as a percentage of total land area) divided among different regions?

Overall, this project aspires to paint a detailed picture of global development by analyzing a diverse set of indicators. Leveraging robust data sources and advanced visualization techniques, I seek to uncover significant trends, correlations, and regional disparities that can inform policy decisions and promote sustainable development worldwide. The ultimate goal is to contribute to a deeper understanding of the complex factors that shape development and to provide actionable insights that can drive positive change.

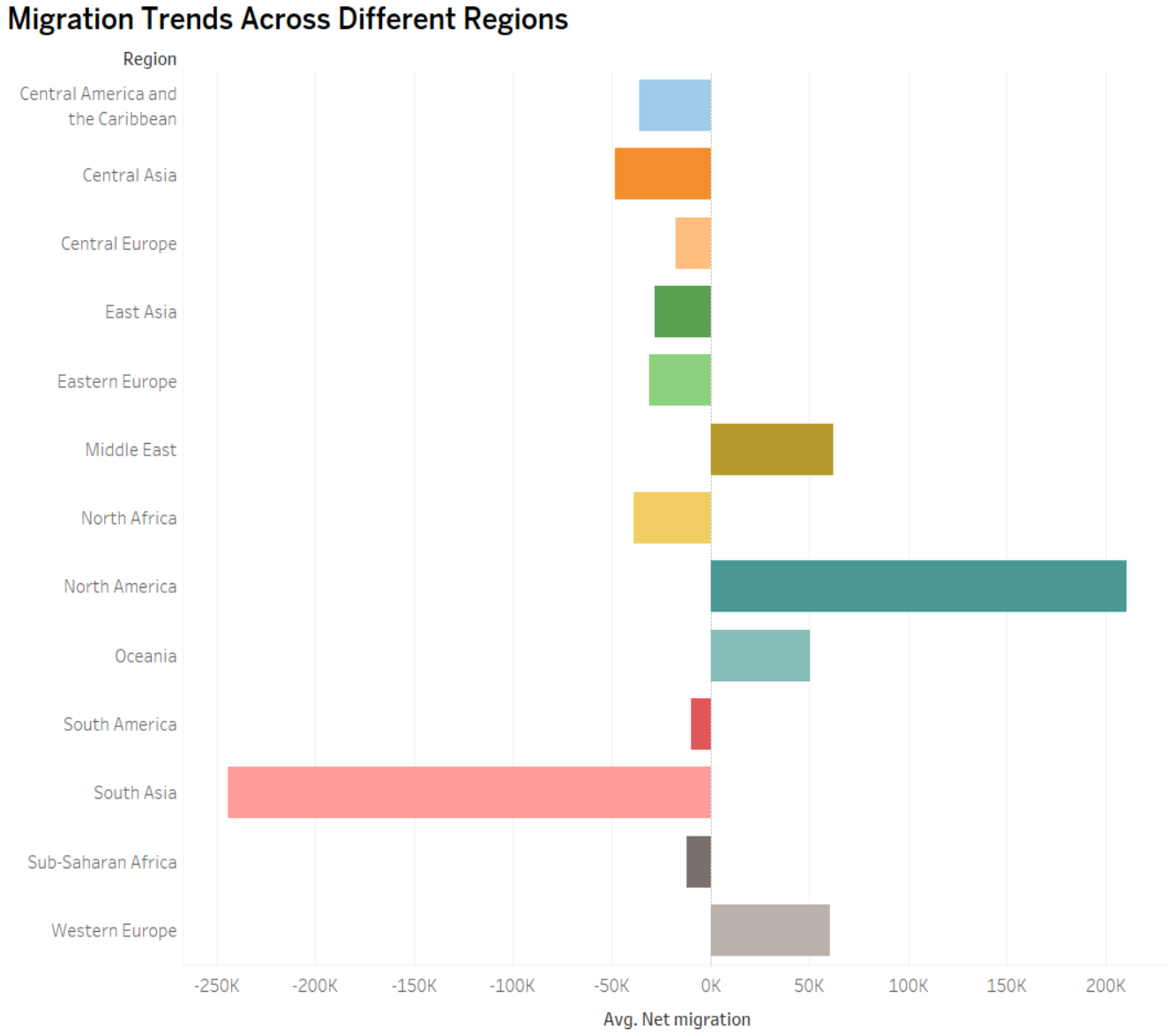
# Analysis

1. **What is the correlation between democratic stability and human development indicators?**



This scatterplot shows that there is a positive correlation between democratic stability and human development. Countries with higher stability of democratic institutions tend to have higher Human Development Index (HDI) scores. This suggests that stable democratic governance is associated with better social services, education, healthcare, and overall quality of life.

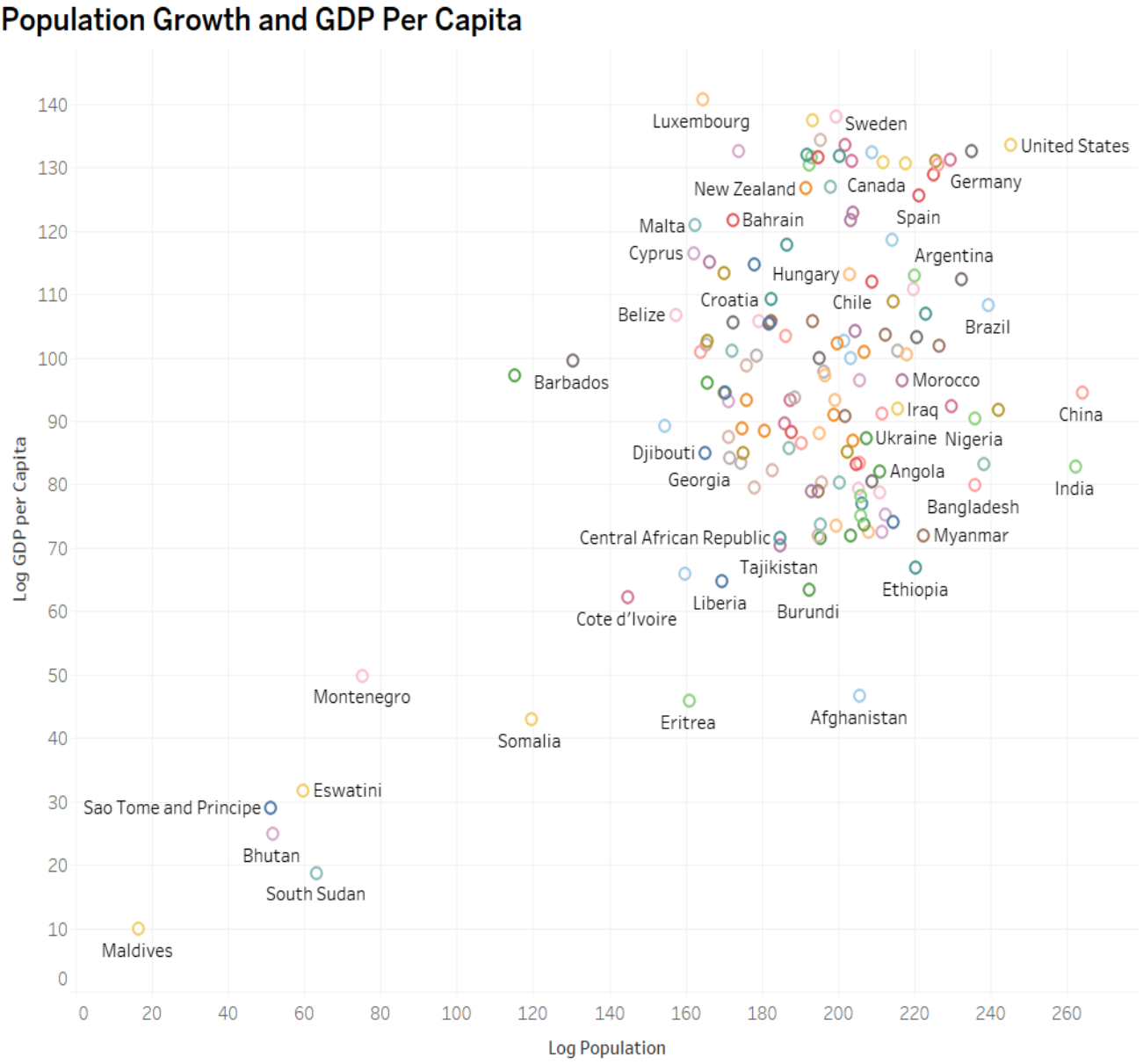
**2. What is the trend in different regions around the world in terms of migration?**




The bar graph reveals significant variation in migration trends across different regions. Regions such as North America and Western Europe exhibit high positive net migration, indicating that these areas are popular destinations for migrants. In contrast, regions like South Asia and Sub-

Saharan Africa show high negative net migration, reflecting that these areas are sources of emigration. These trends highlight the global patterns of human movement driven by economic opportunities, political stability, and quality of life.

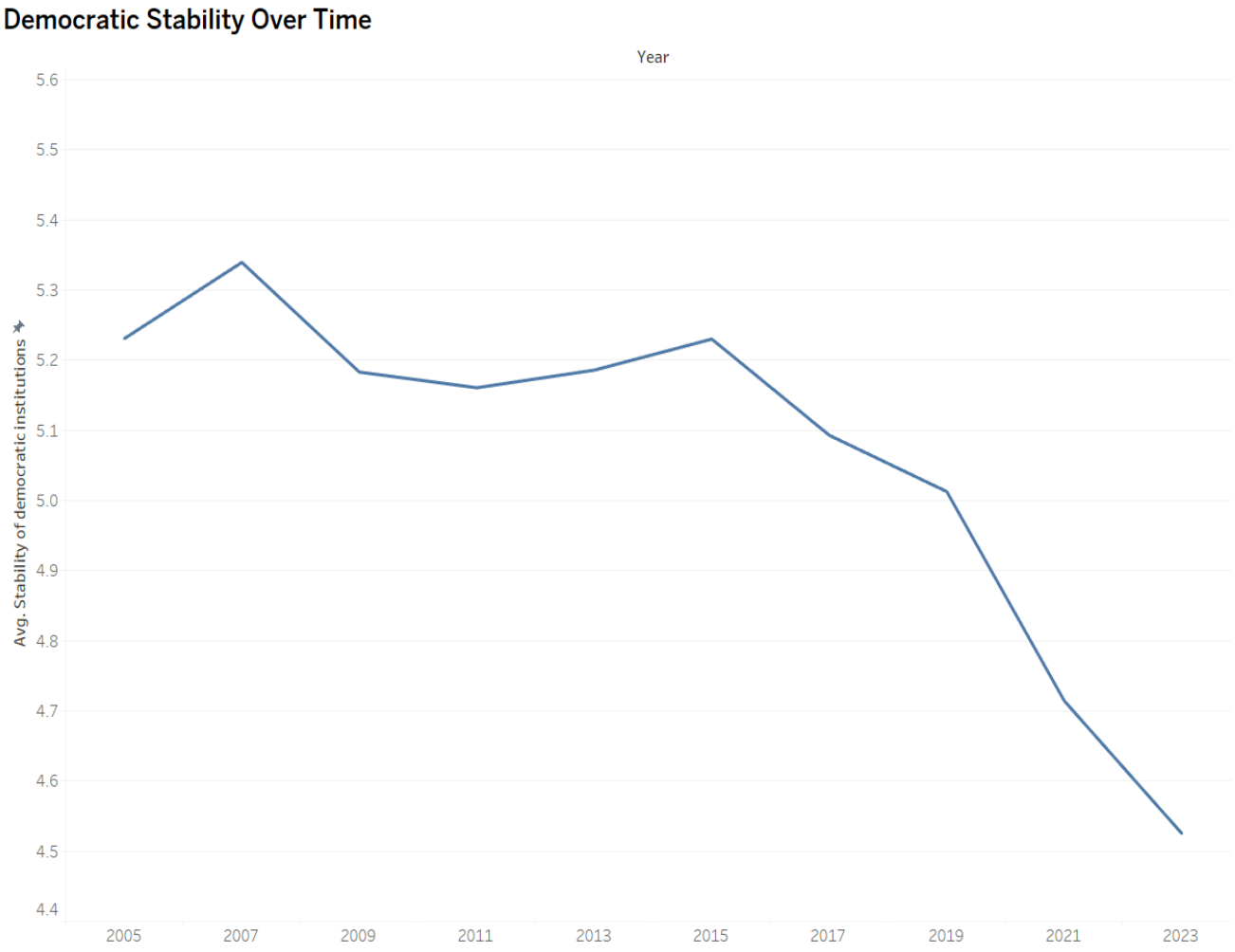
### 3. How does population growth impact GDP per capita across various countries?




The scatter plot highlights the relationship between countries' log-transformed GDP per capita and population sizes. Notable observations include Luxembourg and Sweden, which exhibit high GDP per capita with relatively low populations, contrasted with the United States, which has both

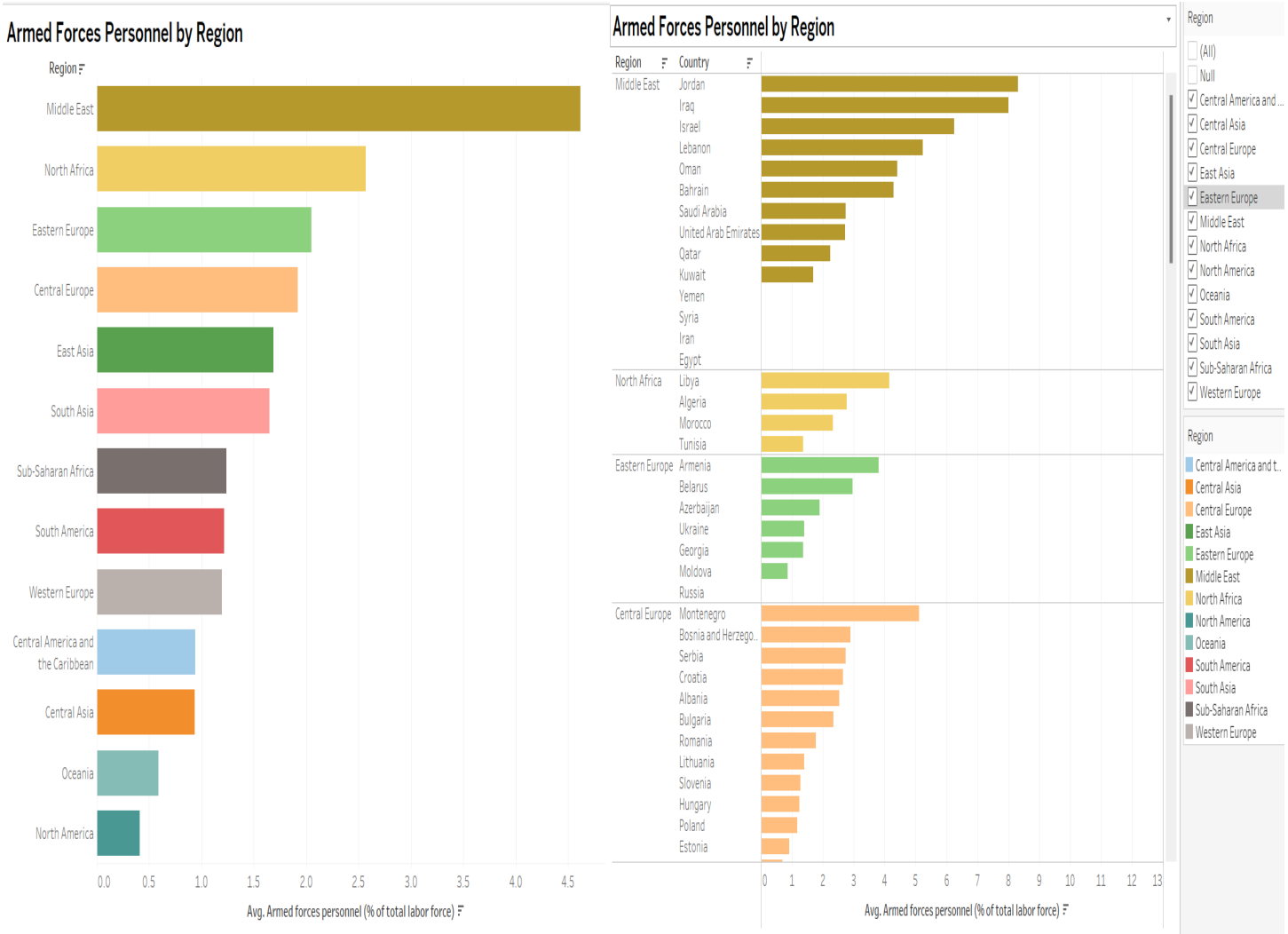
high GDP per capita and a large population. Countries like China and India show low GDP per capita despite their vast populations. Meanwhile, nations such as South Sudan and Malawi have both low GDP per capita and small populations. This visualization underscores significant economic disparities, revealing clusters of wealthy, less populous nations, and densely populated countries with lower GDP per capita.

4. **How does democratic stability range over time?**




The line chart shows a decline in the average stability of democratic institutions from 2005 to 2023. After a peak around 2008 and a period of stability until 2014, the trend gradually declines, with a sharper drop observed from 2017 onwards. The most significant decline occurs between 2019 and 2023, indicating growing instability in democratic institutions in recent years.

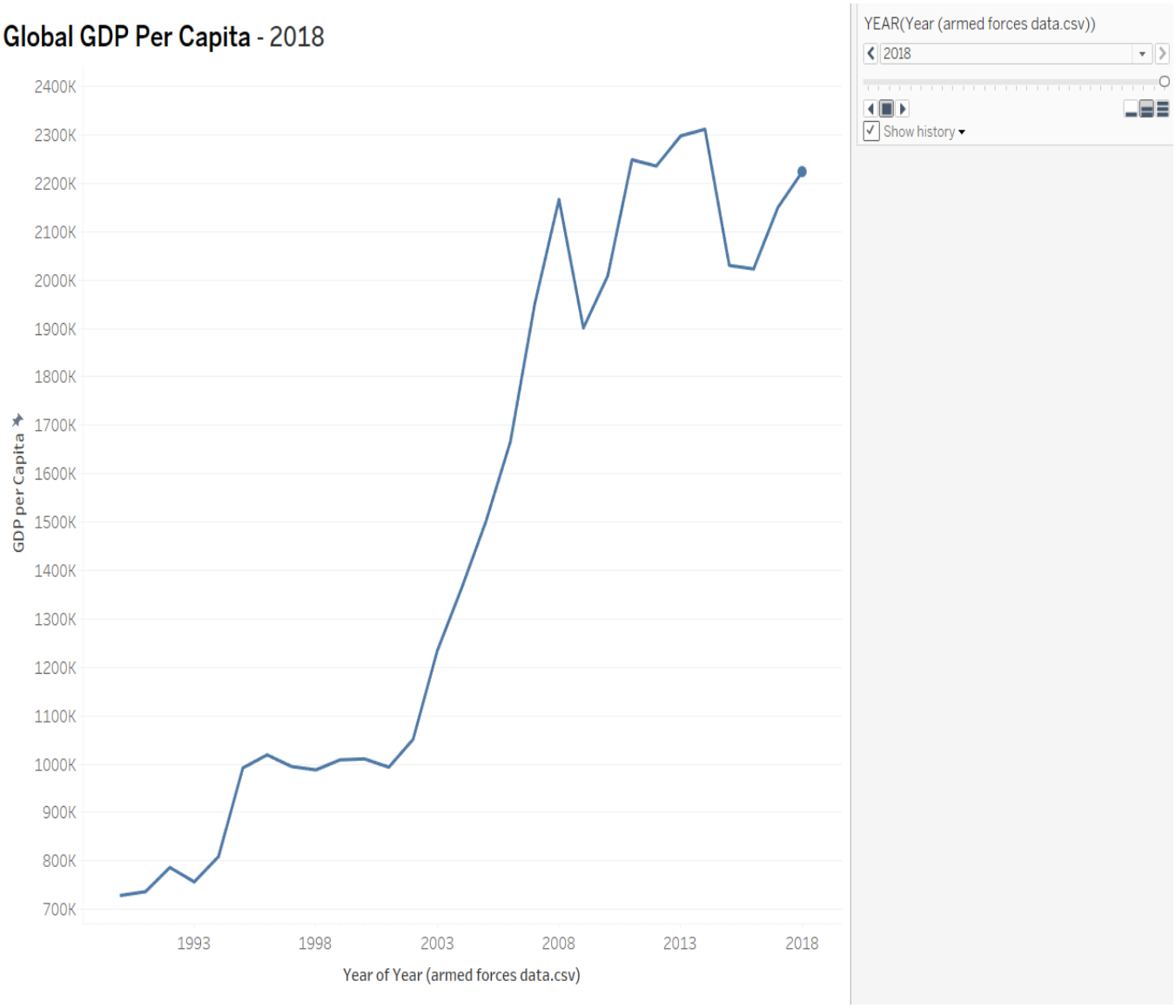
5. **What is the distribution of armed forces personnel (as a percentage of total labor force) across different regions?**




The bar graph indicates that the Middle East has the highest percentage of armed forces personnel relative to the total labor force. Other regions such as North Africa and Eastern Europe also have significant military personnel ratios. In contrast, regions like Western Europe and Oceania have

much lower percentages. This distribution reflects regional security priorities and socio-political contexts.

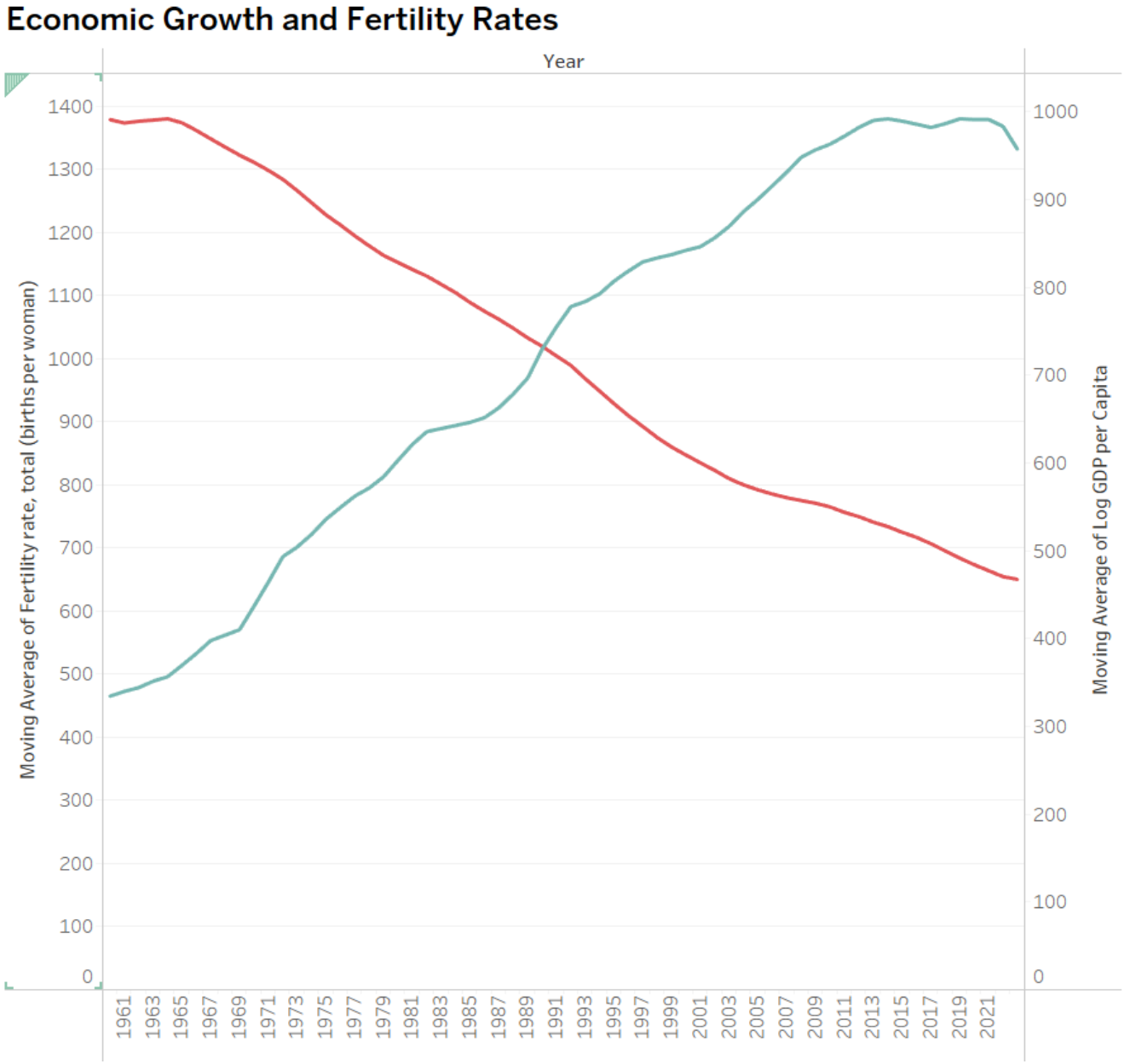
6. **How has the world's GDP per capita changed over the years?**



The line chart shows the trend of global GDP per capita from 1990 to 2018. Key observations include:

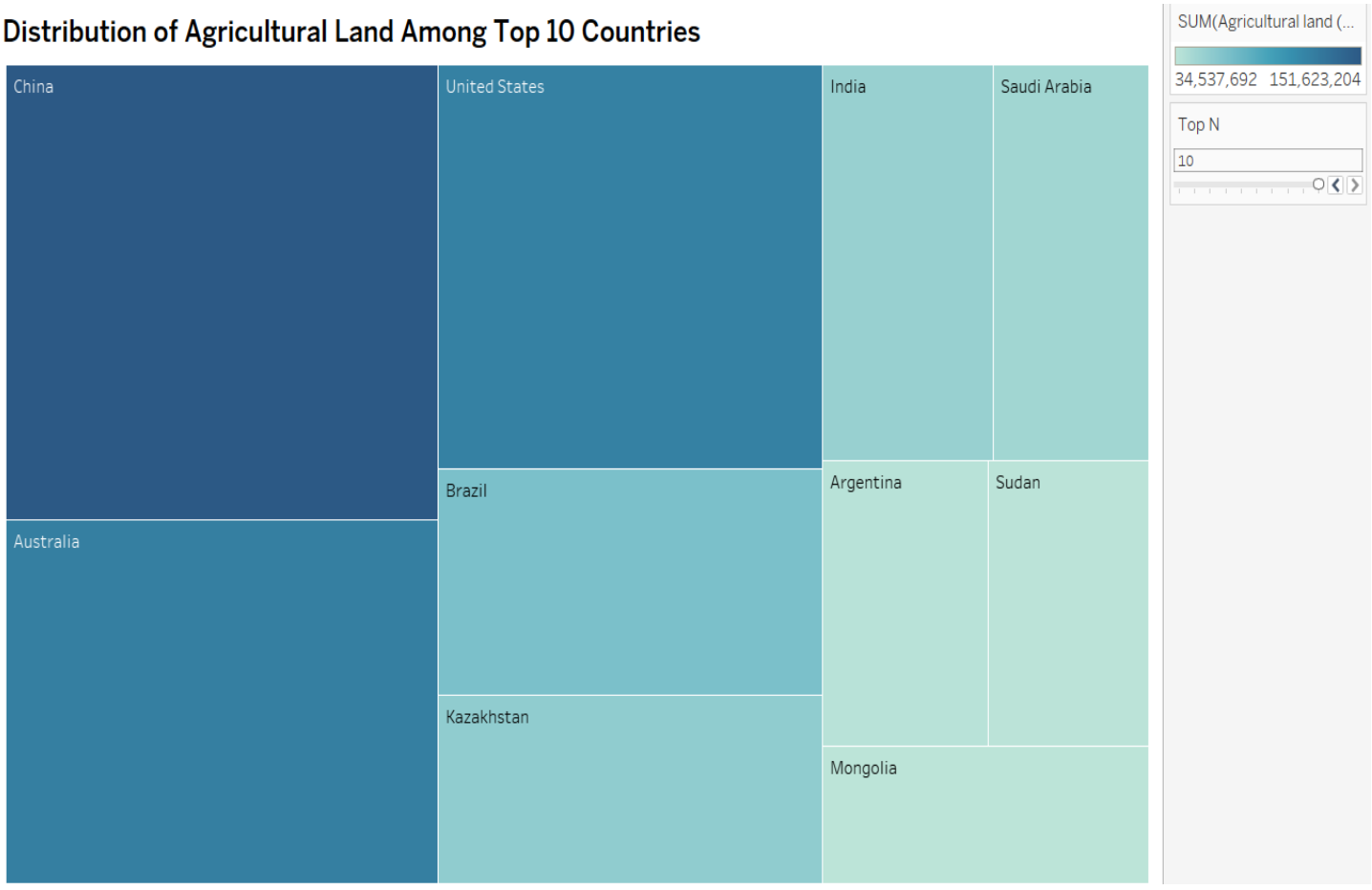
1. **Steady Growth**: From 1990 to around 2002, there is a steady increase in GDP per capita.
2. **Rapid Increase**: From 2002 onwards, there is a sharp and significant rise, peaking around 2008.
3. **Fluctuations**: Post-2008, the trend shows fluctuations with periods of growth and decline.
4. **Recent Rise**: From around 2016 to 2018, there is a noticeable upward trend, indicating recovery and growth in global GDP per capita.

7. **How does economic growth (as indicated by GDP per capita) influence fertility rates around the world?**



The chart shows an inverse relationship between economic growth and fertility rates from 1961 to 2021. As the log GDP per capita steadily increases, indicating economic growth, fertility rates decline sharply. The two measures intersect in the early 1980s, after which economic growth continues to rise while fertility rates fall significantly. This trend highlights the socio-economic changes over the decades, with higher economic growth correlating with lower fertility rates.

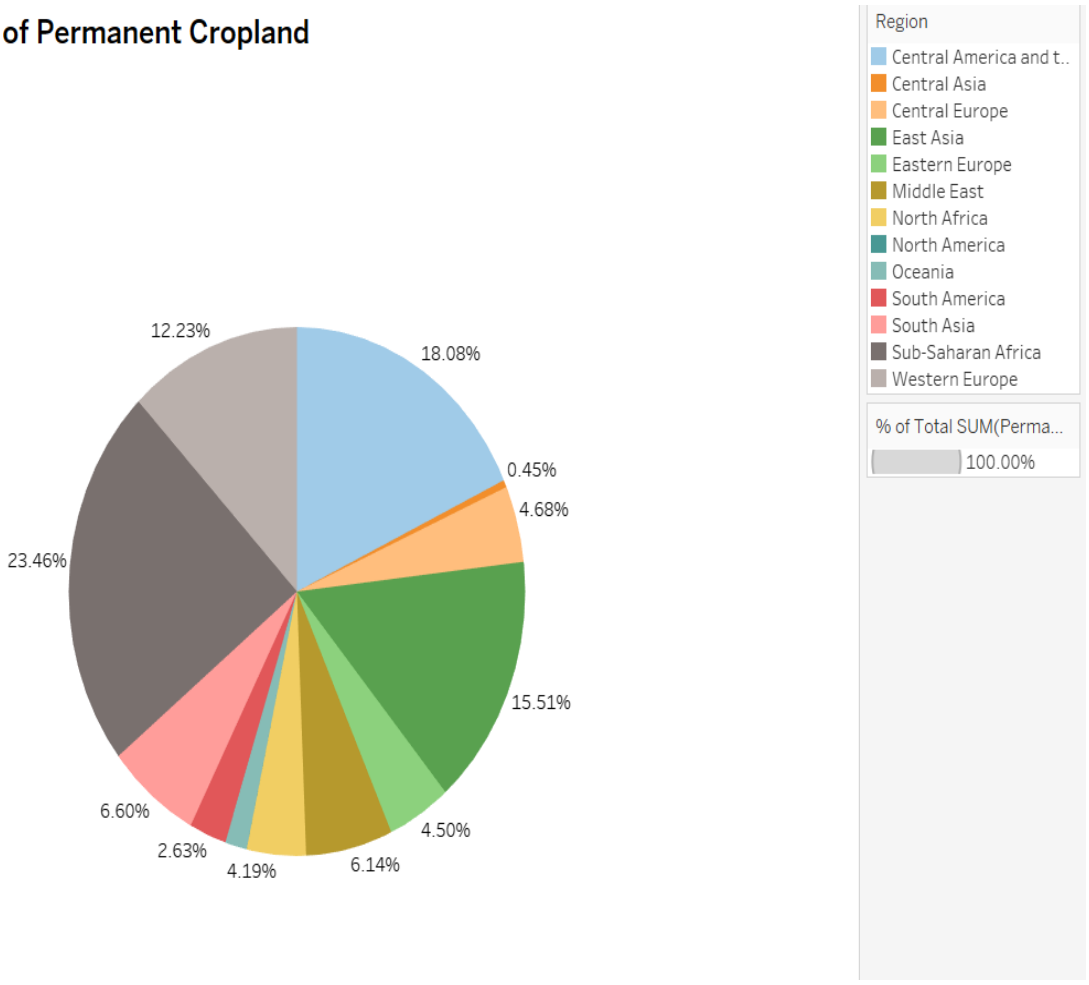
8. **How does the distribution of agricultural land vary among the top 10 countries with the largest agricultural land areas?**




The treemap visualizes the agricultural land area of the top ten countries. China has the largest share, followed by the United States and India. Australia, Brazil, and Saudi Arabia also have significant portions. Argentina, Sudan, Kazakhstan, and Mongolia complete the top ten, with relatively smaller shares. This visualization highlights the dominance of China, the U.S., and

India in agricultural land, illustrating the global distribution and potential agricultural capacity of these nations.

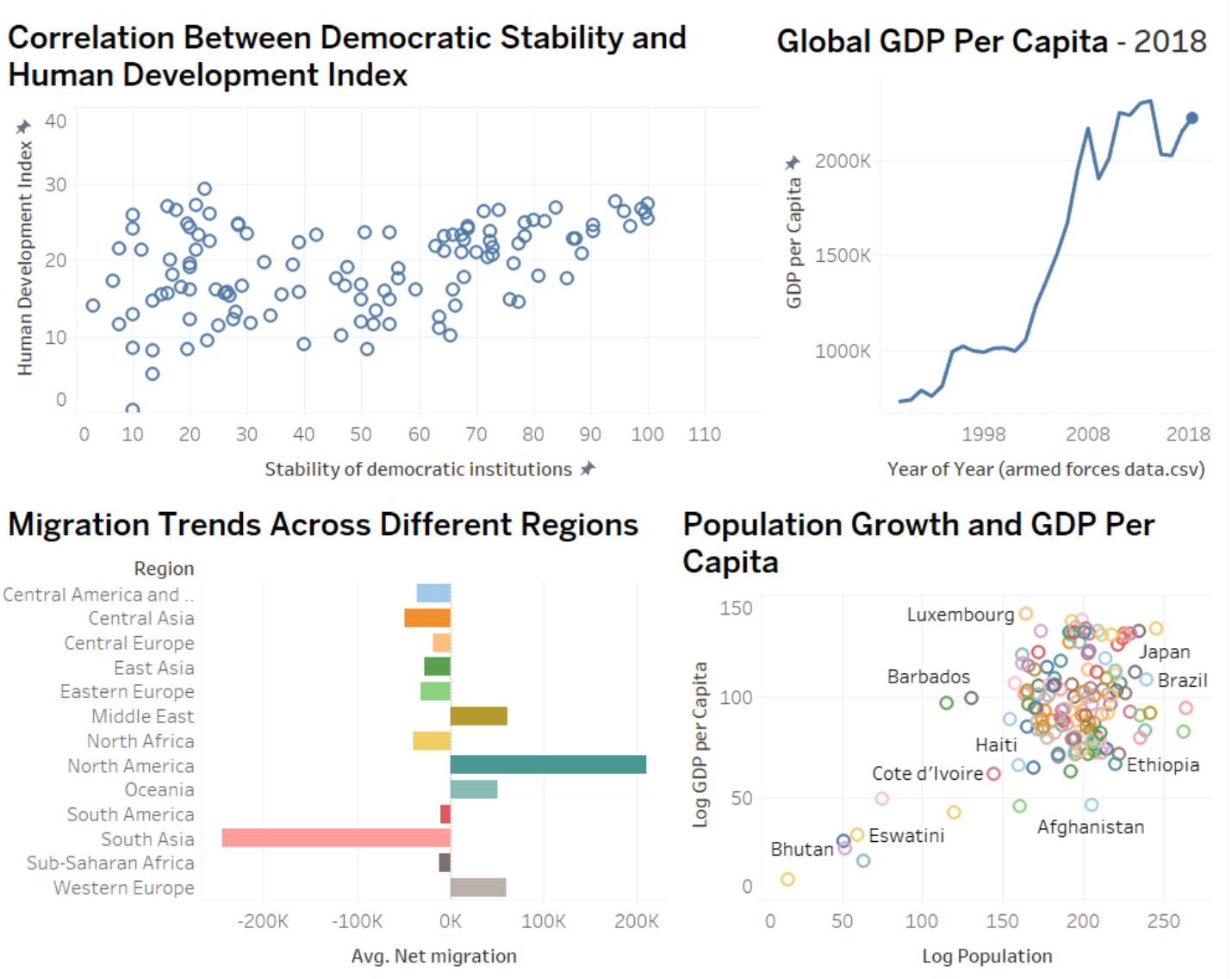
9. **How is the global distribution of permanent cropland (as a percentage of total land area) divided among different regions?**




The visual "Global Distribution of Permanent Cropland" indicates that South Asia, East Asia, and Western Europe have the largest shares of permanent cropland as a percentage of their total land

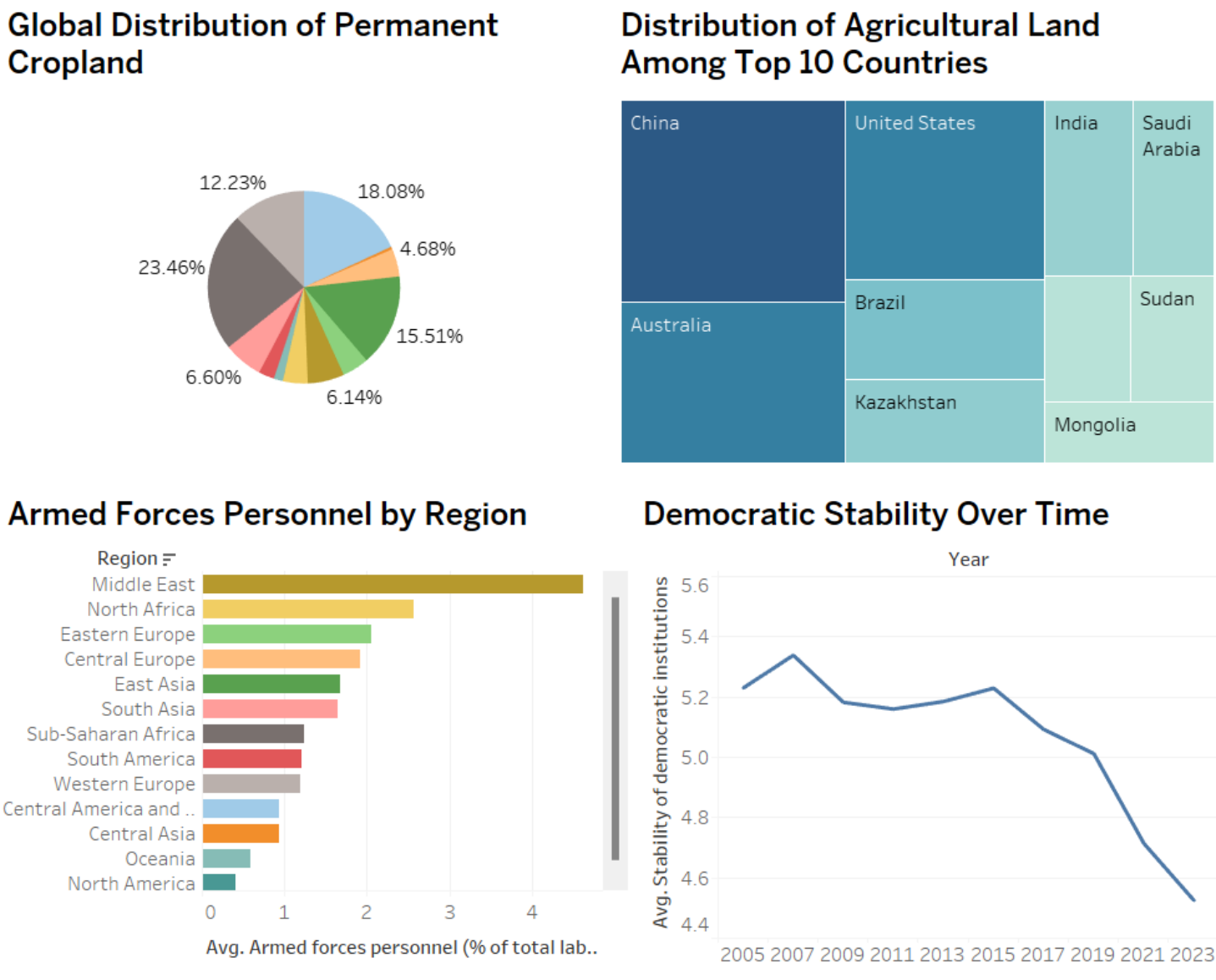
area. These regions rely heavily on agriculture for their economies and food supply. The distribution highlights regional differences in land use and the importance of agriculture in sustaining local populations and economies.

**Dashboard 1:**



The dashboard provides insights into global socio-economic trends. It shows a positive correlation between democratic stability and human development, significant growth in global GDP per capita from 1990 to 2018, and varying migration trends with North America and Western Europe as major migrant destinations. Additionally, it highlights the diverse relationship between population size and GDP per capita, with smaller, wealthy nations like Luxembourg and populous countries like China having lower GDP per capita. Overall, it presents the interplay between democratic stability, economic growth, migration, and population dynamics.

**Dashboard 2:**



The dashboard provides insights into global socio-economic and political trends. It shows that permanent cropland is concentrated in a few countries, with the largest shares held by China and the United States. The Middle East has the highest percentage of armed forces personnel relative to the labor force, followed by North Africa and Eastern Europe. Additionally, there is a notable decline in the stability of democratic institutions from 2005 to 2023. The dashboard highlights the distribution of agricultural land, regional military presence, and the trend of decreasing democratic stability worldwide.

## Conclusion

This comprehensive analysis of global development indicators provides valuable insights into the complex interplay between various economic, social, and political factors. The study utilized robust datasets and advanced visualization tools to explore significant trends, correlations, and regional disparities across nine key indicators.

- The correlation between democratic stability and human development indicators revealed a positive relationship, indicating that stable democratic institutions are often associated with higher human development scores. This underscores the importance of good governance and political stability in promoting social well-being and economic prosperity.
- The examination of migration trends across different regions highlighted significant variations, with North America and Western Europe being major destinations for migrants, while regions like South Asia and Sub-Saharan Africa are significant sources of emigration. These patterns reflect the economic opportunities and quality of life that drive human mobility, as well as the socio-economic challenges faced by regions with high emigration rates.
- Population growth was shown to have a complex impact on GDP per capita. While some countries with high population growth also experienced high GDP per capita, many others struggled to maintain economic performance amidst rapid demographic changes. This

suggests the need for balanced policies that manage population growth while fostering economic development.

- The trend analysis of democratic stability over time indicated a decline in the average stability of democratic institutions from 2005 to 2023. This trend raises concerns about the growing political challenges and their potential implications for social and economic development.
- The distribution of armed forces personnel across different regions reflected varying security priorities and socio-political contexts. The Middle East, North Africa, and Eastern Europe have higher percentages of military personnel, highlighting regional security concerns, while Western Europe and Oceania showed lower percentages.
- Global GDP per capita showed a steady increase from 1990 to 2018, indicating overall economic growth worldwide despite fluctuations due to economic downturns. This trend highlights improvements in global economic conditions and living standards over the years.
- The relationship between economic growth and fertility rates demonstrated an inverse correlation, with higher GDP per capita associated with lower fertility rates. This trend is consistent with better access to education, healthcare, and family planning services in more prosperous economies.
- The analysis of agricultural land distribution among the top 10 countries revealed that China, the United States, and India have the largest shares of agricultural land. This highlights the critical role of these countries in global agricultural production and food security.
- The global distribution of permanent cropland showed that South Asia, East Asia, and Western Europe have the largest shares of permanent cropland relative to their total land area. This reflects the importance of agriculture in sustaining these regions' economies and populations.
- Overall, the study provides a detailed and nuanced picture of global development, offering insights that can inform policy decisions and promote sustainable growth. By understanding the interconnections between various development indicators,

policymakers, development agencies, and researchers can devise strategies that address the unique challenges and opportunities faced by different regions.

## Future Research Questions

1. **How do education levels and literacy rates impact economic development across different countries?**
2. **What is the role of healthcare access and quality in enhancing human development indices?**
3. **How does political stability influence foreign direct investment and economic growth?**
4. **What are the environmental impacts of rapid population growth in developing countries?**
5. **How do gender equality and women's empowerment correlate with overall development indicators?**
6. **What are the effects of climate change on agricultural productivity and food security across different regions?**
7. **How do technological advancements influence economic growth and development disparities?**
8. **What is the relationship between urbanization and socio-economic development in emerging economies?**
9. **How do international trade policies affect the economic development of low-income countries?**
10. **What are the long-term effects of migration on both sending and receiving countries' economies and social structures?**

By exploring these future research questions, we can continue to build on the insights gained from this study, deepening our understanding of global development dynamics and identifying effective strategies for promoting sustainable growth and equity worldwide.