Maddison Project

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Data Overview

The Maddison Project dataset provides historical economic data across various countries and continents, including indicators such as GDP per capita, real GDP per capita, and population. This analysis aims to compare economic trends between Asian and European countries using the provided dataset.

```
#importing the necessary libraries
library(maddison)
```

Warning: package 'maddison' was built under R version 4.3.3

```
library(ggplot2)
library(dplyr)
```

Attaching package: 'dplyr'

The following objects are masked from 'package:stats':

    filter, lag

The following objects are masked from 'package:base':

    intersect, setdiff, setequal, union

```
# Load data from the maddison package
Maddison_data <- data.frame(maddison)

# checking for the summary statistics
summary(Maddison_data)
```

```
 countrycode          country              year              cgdppc
Length:19873       Length:19873       Min.   :   1    Min.   :   134
Class :character   Class :character   1st Qu.:1888    1st Qu.:  1362
Mode  :character   Mode  :character   Median :1958    Median :  2620
                                      Mean   :1902    Mean   :  6753
                                      3rd Qu.:1987    3rd Qu.:  7162
                                      Max.   :2016    Max.   :220717
                                                      NA's   :2432
   rgdpnapc            pop             i_cig              i_bm
Min.   :   158   Min.   :      2   Length:19873       Length:19873
1st Qu.:  1671   1st Qu.:   2206   Class :character   Class :character
Median :  3276   Median :   5735   Mode  :character   Mode  :character
Mean   :  7945   Mean   :  29506
3rd Qu.:  8660   3rd Qu.:  18648
Max.   :412705   Max.   :1372860
NA's   :2161     NA's   :3014
    iso2c              iso3c            continent            region
Length:19873       Length:19873       Length:19873       Length:19873
Class :character   Class :character   Class :character   Class :character
Mode  :character   Mode  :character   Mode  :character   Mode  :character
```

Descriptive Analysis:

Summary statistics of the dataset reveal key insights into the distribution and characteristics of economic indicators such as GDP per capita, real GDP per capita, and population. The dataset is filtered to select specific Asian and European countries for further analysis. 3.

```r
# Selecting only the columns of interest
Reselected_data <- Maddison_data[, c("year", "continent", "country", "cgdppc", "rgdpnapc", "

# Filter data for Asian and European countries
Asian_countries <- c("China", "India", "Afghanistan")
European_countries <- c("France","Germany","Spain")

Asian_data <- Reselected_data %>%
  filter(continent == "Asia" & country %in% Asian_countries)

European_data <- Reselected_data %>%
```

```
  filter(continent == "Europe" & country %in% European_countries)

# Filter data for years 2000 to 2010
Asian_data_2000_2010 <- Asian_data %>%
  filter(year >= 2000 & year <= 2010)

European_data_2000_2010 <- European_data %>%
  filter(year >= 2000 & year <= 2010)
```

Growth Rate Analysis:

Annual growth rates are computed for GDP per capita, real GDP, and population for both Asian and European countries. Growth rate calculations provide insights into the pace of economic expansion and demographic changes over time.

```
#Function to compute annual growth rate
compute_growth_rate <- function(x) {
  return ((x - lag(x)) / lag(x)) * 100
}

# Remove rows with missing values
Asian_data <- na.omit(Asian_data)
European_data <- na.omit(European_data)


# Calculate GDP per capita growth rates for Asia and Europe
gdp_per_capita_growth_asia <- compute_growth_rate(Asian_data$cgdppc)
gdp_per_capita_growth_europe <- compute_growth_rate(European_data$cgdppc)

# Calculate population growth rates for Asia and Europe
population_growth_asia <- compute_growth_rate(Asian_data$pop)
population_growth_europe <- compute_growth_rate(European_data$pop)

# Calculate real GDP growth rates for Asia and Europe
real_gdp_growth_asia <- compute_growth_rate(Asian_data$rgdpnapc)
real_gdp_growth_europe <- compute_growth_rate(European_data$rgdpnapc)
```

Trend Analysis:

Trends in GDP per capita, population growth, and real GDP growth are visualized using line plots for Asian and European countries. The plots illustrate the trajectory of economic development and demographic changes over the years for selected countries in Asia and Europe.

```
# Plotting the trends for GDP per capita (2000-2010)
ggplot() +
  geom_line(data = Asian_data_2000_2010, aes(x = year, y = cgdppc, color = country)) +
  geom_line(data = European_data_2000_2010, aes(x = year, y = cgdppc, color = country)) +
  labs(title = "Trend Analysis of GDP per Capita (2000-2010)", x = "Year", y = "GDP per Capi
  scale_color_manual(values = c("China" = "blue", "India" = "red", "Afghanistan" = "green",
```


Trend Analysis of GDP per Capita (2000–2010)
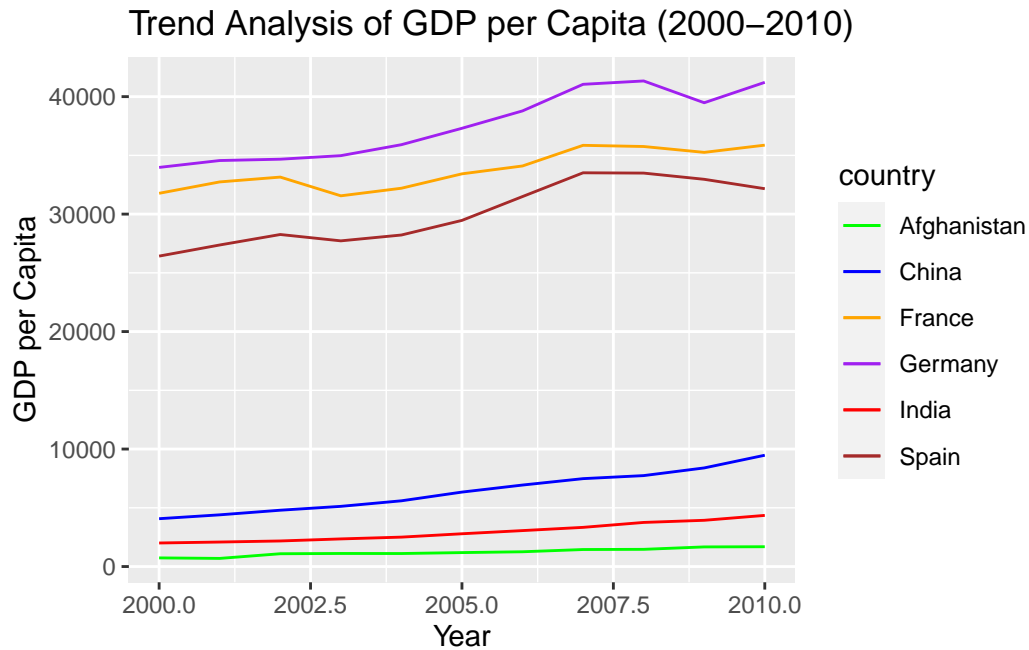
The GDP per capita growth rates among Afghanistan, China, France, Germany, India, and Spain exhibit variations during the ten-year period from 2000 to 2010. Some countries, notably Germany, experienced significant economic expansion, followed by France and Spain, in contrast to others. From the visual representations, it's evident that Afghanistan maintained consistently low GDP growth throughout the years, while India showed a slight upward trend. China displayed the most stable and steady increase in GDP. Furthermore, although Germany, France, and Spain showed positive growth overall, there appears to be a trend of GDP decline from late 2006 to early 2009, followed by a recovery from 2009 onwards. Notably, since Spain, France, and Germany are European countries, it is plausible to consider potential economic conditions that may have influenced the observed downturn in GDP during the years leading up to 2006 to 2009.

```
# Plotting the trends for Population growth (2000-2010)
ggplot() +
  geom_line(data = Asian_data_2000_2010, aes(x = year, y = pop, color = country)) +
```

```
  geom_line(data = European_data_2000_2010, aes(x = year, y = pop, color = country)) +
  labs(title = "Trend Analysis of Population Growth (2000-2010)", x = "Year", y = "Population
  scale_color_manual(values = c("China" = "blue", "India" = "red", "Afghanistan" = "green",
```

Trend Analysis of Population Growth (2000−2010)
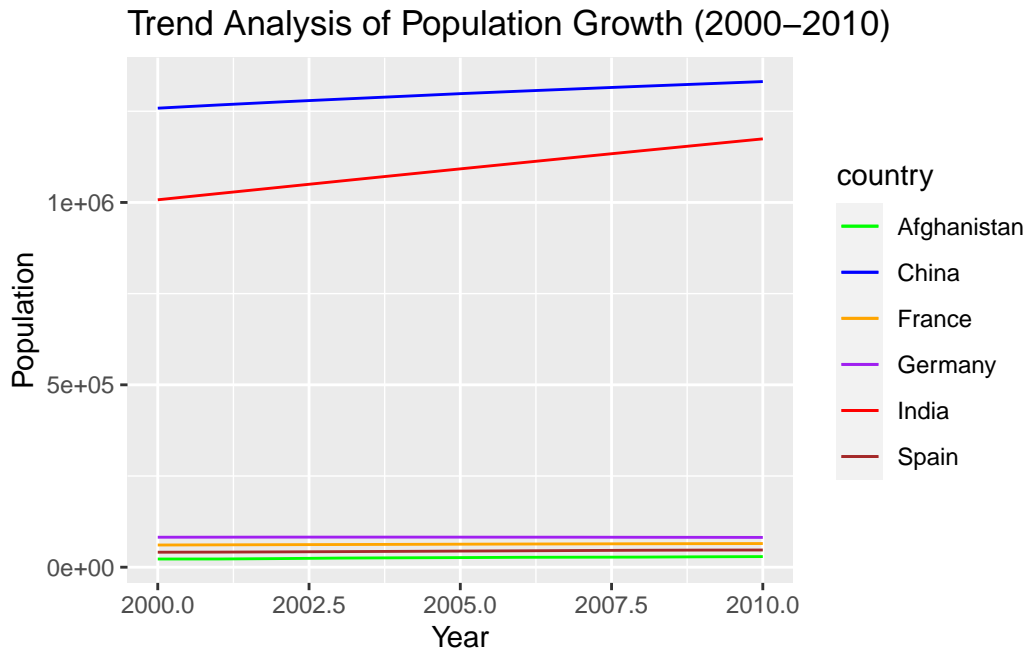
Here, we try to compare population Growth, for year 2000-2010. Population growth between Asia and Europe are drastically different. We all know that India and China have topped the charts since a long time, but between the year 2000-2010, China was above India, unlike now. Germany, France, Spain, and Afghanistan are somewhat around the same level, with Afghanistan at the lowest. We can see that typically the Asian countries, or developing ones have a higher population while the European countries are pretty low with Afghanistan being an outlier. WHich can be explained due to the extreme situations in the country.

```
# Plotting the trends for Real GDP growth (2000-2010)
ggplot() +
  geom_line(data = Asian_data_2000_2010, aes(x = year, y = rgdpnapc, color = country)) +
  geom_line(data = European_data_2000_2010, aes(x = year, y = rgdpnapc, color = country)) +
  labs(title = "Trend Analysis of Real GDP Growth (2000-2010)", x = "Year", y = "Real GDP") +
  scale_color_manual(values = c("China" = "blue", "India" = "red", "Afghanistan" = "green",
```

Trend Analysis of Real GDP Growth (2000–2010)
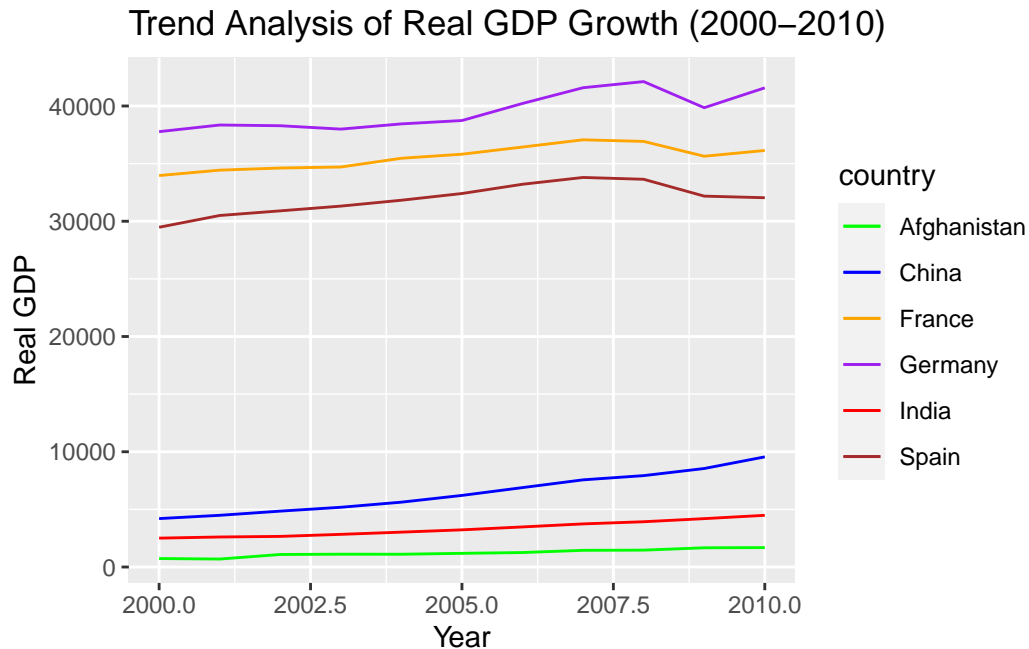
Similar to GDP per capita, real GDP growth rates vary significantly among the selected countries. Germany emerges as a standout performer, experiencing robust and sustained economic expansion throughout the period. France and Spain follow suit, demonstrating considerable growth, albeit with fluctuations. In contrast, Afghanistan exhibits stagnant growth, while India shows a moderate upward trajectory. China maintains a steady and stable incline, reflecting its consistent economic growth over the years. Just as observed in the GDP per capita graph, there is a noticeable downturn in real GDP for Germany, France, and Spain from late 2006 to early 2009, followed by a subsequent recovery. This pattern suggests a period of economic downturn, possibly influenced by external factors such as the global financial crisis during that period. The subsequent rebound indicates resilience and adaptive capacity within these economies.

Conclusion

The analysis provides valuable insights into the economic trends and growth dynamics of selected Asian and European countries. By comparing key indicators such as GDP per capita, population growth, and real GDP growth, policymakers and researchers can gain a better understanding of regional economic disparities and formulate targeted policies to promote sustainable growth and development.