EDA Analyis Report

Nicole Chen

2025-02-24

Introduction

This report aims to present an exploratory data analysis of the World Bank data for the "World" region in 2022(Bank 2022). We will focus on three key indicators - "Life Expectancy, Exports as a Share of GDP, and Education Expenditure as a Share of GDP" - and include visualizations and statistical summaries.

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

Data Loading

```
df = pd.read_csv("wdi.csv")
df.head()
```

	country	inflation_rate	exports_gdp_share	gdp_growth_rate	gdp_per_capita	adult_lite
0	Afghanistan	NaN	18.380042	-6.240172	357.261153	NaN
1	Albania	6.725203	37.197085	4.826688	6846.426143	98.5
2	Algeria	9.265516	30.808979	3.600000	4961.552577	NaN
3	American Samoa	NaN	46.957520	1.735016	18017.458938	NaN
4	Andorra	NaN	NaN	9.564612	42414.059009	NaN

Exploratory Data Analysis for Three Factors

Data Overview

Table (**ref?**)(tab:summary-table) provides a summary of key economic indicators used in this analysis.

```
df.info()
df.describe()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 217 entries, 0 to 216
Data columns (total 14 columns):
 #   Column                          Non-Null Count  Dtype
---  ------                          --------------  -----
 0   country                         217 non-null    object
 1   inflation_rate                  173 non-null    float64
 2   exports_gdp_share               179 non-null    float64
 3   gdp_growth_rate                 206 non-null    float64
 4   gdp_per_capita                  207 non-null    float64
 5   adult_literacy_rate             54 non-null     float64
 6   primary_school_enrolment_rate   156 non-null    float64
 7   education_expenditure_gdp_share 137 non-null    float64
 8   measles_immunisation_rate       193 non-null    float64
 9   health_expenditure_gdp_share    20 non-null     float64
 10  income_inequality               28 non-null     float64
 11  unemployment_rate               186 non-null    float64
 12  life_expectancy                 209 non-null    float64
 13  total_population                217 non-null    float64
dtypes: float64(13), object(1)
memory usage: 23.9+ KB
```

	inflation_rate	exports_gdp_share	gdp_growth_rate	gdp_per_capita	adult_literacy_rate	pr
count	173.000000	179.000000	206.000000	207.000000	54.000000	15
mean	12.404067	47.630189	4.393817	20520.336828	80.971722	10
std	19.467053	35.631646	6.706923	30640.741594	18.430839	12
min	-6.687321	1.571162	-28.758584	250.634225	27.280001	67
25%	5.518129	24.363501	2.545226	2599.752468	74.760000	94
50%	7.930929	40.817640	4.213483	7606.237525	85.452465	99
75%	11.665567	59.741910	6.200000	27542.145523	95.875000	10

	inflation_rate	exports_gdp_share	gdp_growth_rate	gdp_per_capita	adult_literacy_rate	pr
max	171.205491	211.278206	63.334587	226052.001905	100.000000	15

Checking for Missing Values

```
df.isnull().sum()
```

```
country                              0
inflation_rate                      44
exports_gdp_share                   38
gdp_growth_rate                     11
gdp_per_capita                      10
adult_literacy_rate                163
primary_school_enrolment_rate       61
education_expenditure_gdp_share     80
measles_immunisation_rate           24
health_expenditure_gdp_share       197
income_inequality                  189
unemployment_rate                   31
life_expectancy                      8
total_population                     0
dtype: int64
```

Factor 1: Life Expectancy

```
df["life_expectancy"].describe()
```

```
count    209.000000
mean      72.416519
std        7.713322
min       52.997000
25%       66.782000
50%       73.514634
75%       78.475000
max       85.377000
Name: life_expectancy, dtype: float64
```

Factor 2: Exports as a Share of GDP

```
df["exports_gdp_share"].describe()
```

```
count    179.000000
mean      47.630189
std       35.631646
min        1.571162
25%       24.363501
50%       40.817640
75%       59.741910
max      211.278206
Name: exports_gdp_share, dtype: float64
```

Factor 3: Education Expenditure as a Share of GDP

```
df["education_expenditure_gdp_share"].describe()
```

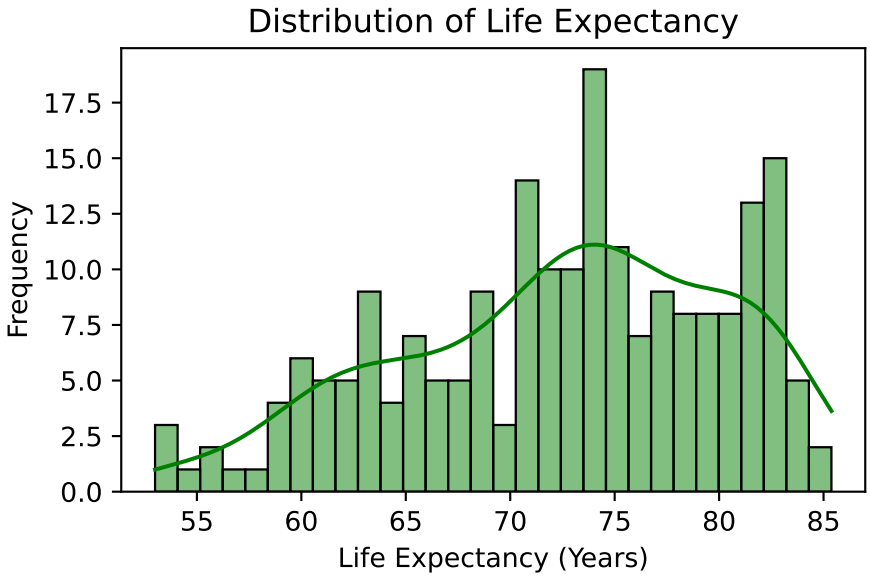
```
count    137.000000
mean       4.164884
std        1.771027
min        0.348517
25%        2.951592
50%        3.938396
75%        4.959176
max       10.703345
Name: education_expenditure_gdp_share, dtype: float64
```

Visualizations

Distribution of Life Expectancy

```
plt.figure(figsize=(5,3))
sns.histplot(df["life_expectancy"].dropna(), bins=30, kde=True, color="green")
plt.title("Distribution of Life Expectancy")
plt.xlabel("Life Expectancy (Years)")
```

```
plt.ylabel("Frequency")
plt.show()
```



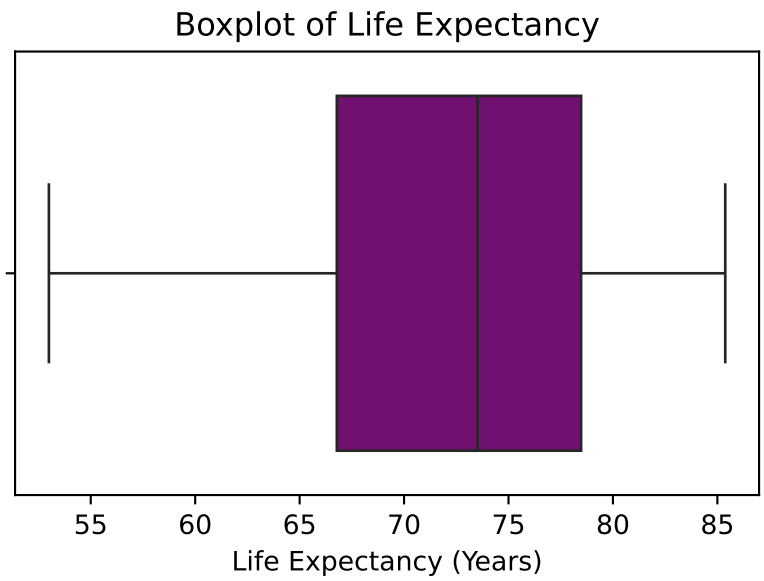
: Distribution of Life Expectancy {#fig:life-expectancy}

Findings 1:

As shown in (**ref?**)(fig:life-expectancy), most countries have a life expectancy between 60 and 80 years. There are outliers with low life expectancy, which could indicate conflicts or poor healthcare.

Boxplot of Life Expectancy

```
plt.figure(figsize=(5,3))
sns.boxplot(x=df['life_expectancy'], color='purple')
plt.title("Boxplot of Life Expectancy")
plt.xlabel("Life Expectancy (Years)")
plt.show()
```



: Boxplot of Life Expectancy {#fig:life-expectancy2}

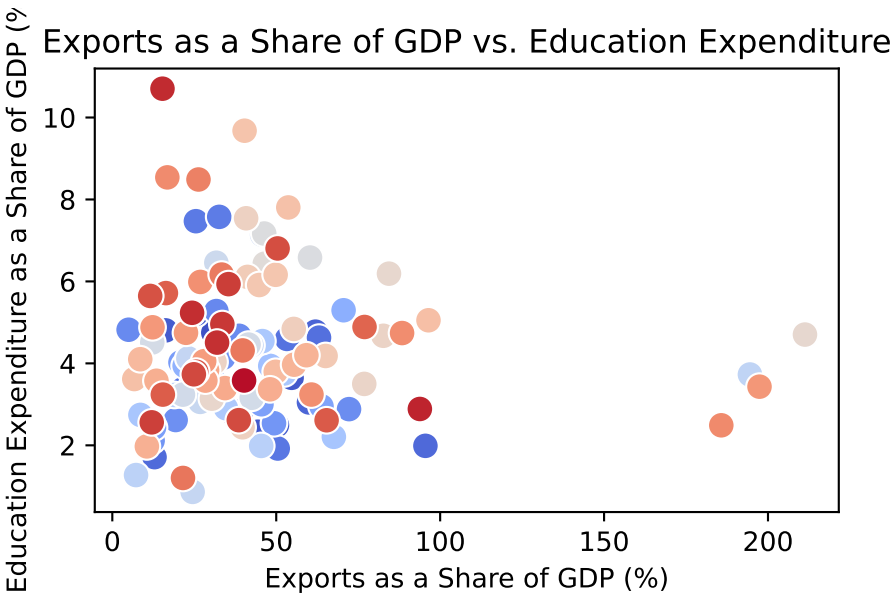
Findings 2:

As shown in (**ref?**)(fig:life-expectancy2), the boxplot confirms the presence of lower outliers in life expectancy. The median value is around 72 years, aligning with the statistical summary.

Scatter Plot of Exports vs. Education Expenditure

Figure (**ref?**)(fig:exports-vs-education) illustrates the relationship between Exports as a Share of GDP and Education Expenditure.

```
plt.figure(figsize=(5,3))
sns.scatterplot(data=df, x="exports_gdp_share", y="education_expenditure_gdp_share", hue="cou
plt.title("Exports as a Share of GDP vs. Education Expenditure")
plt.xlabel("Exports as a Share of GDP (%)")
plt.ylabel("Education Expenditure as a Share of GDP (%)")
plt.show()
```



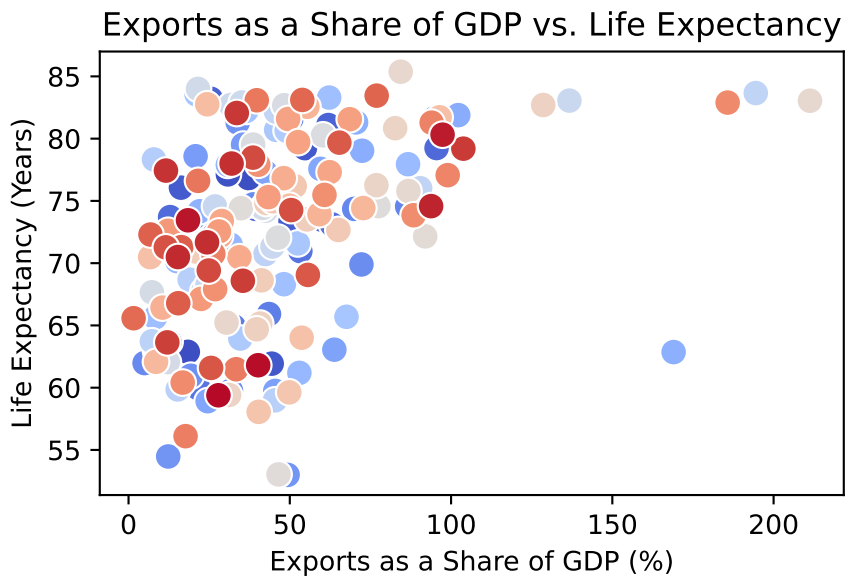
: Relationship between Exports as a Share of GDP and Education Expenditure {#fig:exports-vs-education}

Findings 3:

As shown in (**ref?**)(fig:exports-vs-education), Countries with higher exports do not necessarily allocate more to education. This suggests that economic priorities vary, with some nations investing heavily in education regardless of trade levels.

Scatter Plot of Exports vs. Life Expectancy

```
plt.figure(figsize=(5,3))
sns.scatterplot(data=df, x='exports_gdp_share', y='life_expectancy', hue='country', palette=
plt.title("Exports as a Share of GDP vs. Life Expectancy")
plt.xlabel("Exports as a Share of GDP (%)")
plt.ylabel("Life Expectancy (Years)")
plt.show()
```



: Relationship between Exports as a Share of GDP and Life Expectancy {#fig:exports-vs-life-expectancy}

Findings 3:

As shown in (**ref?**)(fig:exports-vs-life-expectancy), exports as a share of GDP shows high variability, with some economies relying heavily on trade while others do not. Also, education expenditure varies widely, suggesting different government spending priorities.

Summary Table

Table (**ref?**)(tab:summary-table) provides a statistical summary of the three key indicators.

```
summary_table = df[["life_expectancy", "exports_gdp_share", "education_expenditure_gdp_share"
summary_table
```

	life_expectancy	exports_gdp_share	education_expenditure_gdp_share
count	209.000000	179.000000	137.000000
mean	72.416519	47.630189	4.164884
std	7.713322	35.631646	1.771027
min	52.997000	1.571162	0.348517
25%	66.782000	24.363501	2.951592

	life_expectancy	exports_gdp_share	education_expenditure_gdp_share
50%	73.514634	40.817640	3.938396
75%	78.475000	59.741910	4.959176
max	85.377000	211.278206	10.703345

: Summary statistics of selected World Bank indicators {#tab:summary-table}

Cross-Referenced Discussion

As shown in **Table (ref?)(tab:summary-table)**, the mean life expectancy is approximately 72 years, with a significant variation among countries. **Figure (ref?)(fig:exports-vs-education)** suggests that there is no strong correlation between Exports as a Share of GDP and Education Expenditure, indicating different national priorities regarding trade and education funding.

Furthermore, **Figure (ref?)(fig:life-expectancy)** demonstrates that life expectancy varies widely among nations, with most countries clustering between 60 and 80 years. This aligns with global health disparities highlighted in prior research (Bank 2022; (UNDP) 2022).

References

Bank, World. 2022. "World Development Indicators 2022." *World Bank Publications*. https://databank.worldbank.org/source/world-development-indicators.

(UNDP), United Nations Development Programme. 2022. "Human Development Report 2021/2022: Uncertain Times, Unsettled Lives." *United Nations Publications*. https://hdr.undp.org/content/human-development-report-2021-22.