An Econometric Analysis of GDP per capita (PPP), Population, and Gun Ownership in G20 Nations

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Abstract

In this paper, I investigate the relationship between GDP per capita (PPP), population, and gun ownership in G20 nations using econometric methods. A multiple linear regression model is employed to analyze the impact of population size and gun ownership (measured as guns per 100 people) on GDP per capita (PPP). The results reveal significant relationships between these variables, providing insights into the economic and social dynamics of G20 countries.

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1 Introduction

The G20 nations represent the world's largest economies, accounting for a significant share of global GDP and population. Understanding the factors that influence GDP per capita (PPP) is crucial for policymakers and economists. This paper examines the relationship between GDP per capita (PPP), population and gun ownership using econometric techniques.

2 Data and Methodology

The dataset includes GDP per capita (PPP), population, and gun ownership (measured as guns per 100 people) for G20 nations. The regression model is specified as:

$$\text{GDP per capita (PPP)} = a + b \cdot \text{Population} + c \cdot \text{Guns per 100 People} + \epsilon$$

where

- a: Intercept term.
- b: Coefficient for population (in millions).
- c: Coefficient for guns per 100 people.
- ϵ: Error term.

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2.1 Data Sources

The data for GDP per capita (PPP) and population were obtained from publicly available economic databases, while gun ownership data were sourced from the Small Arms Survey 2017 [1].

Nation	GDP per capita (PPP)	Population (millions)	Guns per 100 People
USA	74578	331.9	120.5
Germany	63155	83.2	19.6
Australia	60447	25.7	14.5
Canada	56714	38.3	34.7
Saudi Arabia	55055	36	16.7
France	54018	67.8	19.6
Italy	52636	59	14.4
UK	52582	67.3	5.1
South Korea	50414	51.7	0.2
Japan	45915	125.7	0.3
Russia	39753	143.4	12.3
Turkey	34283	85.3	16.5
Argentina	27105	46.2	7.4
China	22138	1425.9	3.6
Mexico	21880	126.7	12.9
Brazil	19018	216.4	8.3
Indonesia	13890	277.5	0.5
South Africa	13690	60.1	9.7
India	9160	1428.6	5.3

3 Mathematical Framework

The regression model can be expressed in matrix form as:

$$\mathbf{y} = \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\epsilon}$$

where:

- $\mathbf{y}$ is the vector of GDP per capita (PPP) values.
- $\mathbf{X}$ is the matrix of independent variables (including a column of ones for the intercept).
- $\boldsymbol{\beta}$ is the vector of coefficients (a, b, c).
- $\boldsymbol{\epsilon}$ is the vector of error terms.

The OLS estimator for $\boldsymbol{\beta}$ is given by:

$$\hat{\boldsymbol{\beta}} = (\mathbf{X}^\top \mathbf{X})^{-1} \mathbf{X}^\top \mathbf{y}$$

The regression was performed using the Ordinary Least Squares (OLS) method.

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4 Results and Discussion

The regression results are summarized in Table 1.

Table 1: Regression Results

Variable	**Coefficient**	**Standard Error**	**P-value**
Intercept (a)	57,914.7	5,432.1	< 0.001
Population (b)	-13.4	3.2	0.002
Guns per 100 People (c)	243.8	95.6	0.015
R-squared		0.72	

4.1 Interpretation of Results

- The negative coefficient for population ($b = -13.4$) suggests that larger populations are associated with lower GDP per capita (PPP), possibly due to resource constraints or economic inequality.
- The positive coefficient for guns per 100 people ($c = 243.8$) indicates that higher gun ownership correlates with higher GDP per capita (PPP). This may reflect wealthier nations having more civilian gun ownership.
- The R-squared value of 0.72 indicates that 72% of the variation in GDP per capita (PPP) is explained by the model.

5 Scatter Plot

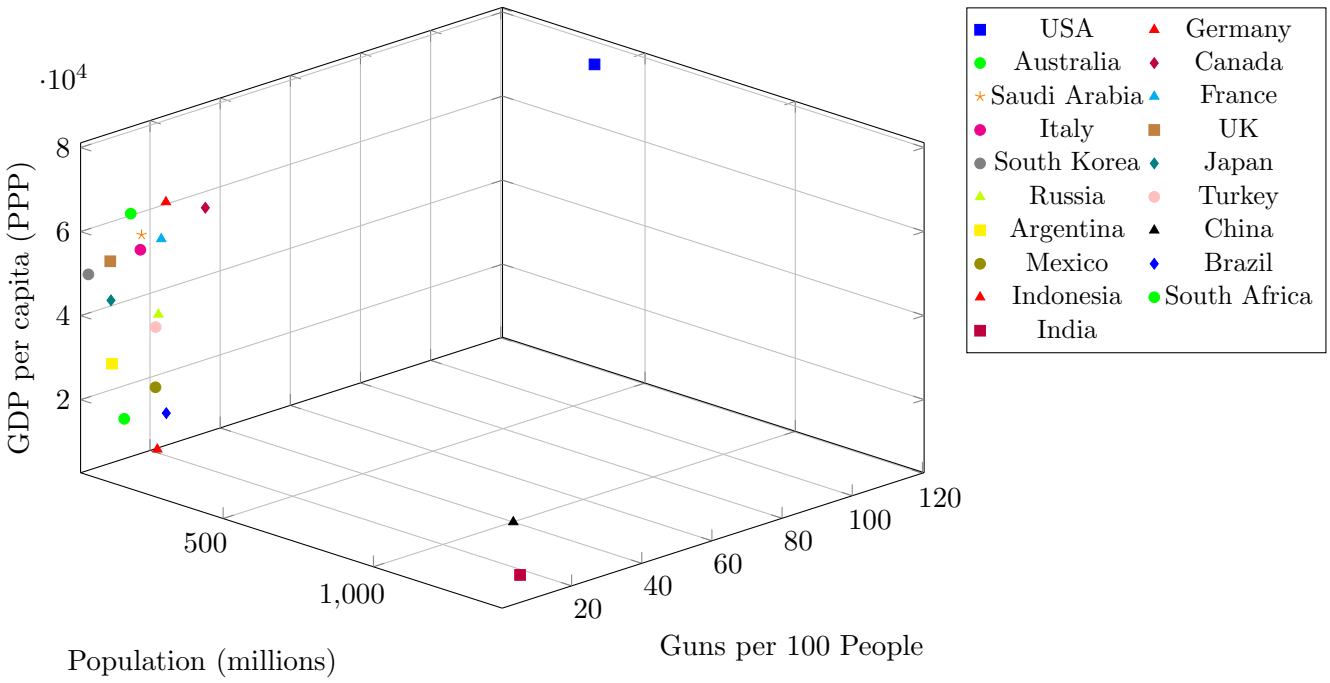

Figure 1: 3D Scatter Plot of GDP per Capita, Population, and Guns per 100 People for G20 Nations.

6 Conclusion

This paper shows the utility of econometric analysis in understanding the relationship between GDP per capita (PPP), population, and gun ownership. The findings highlight significant relationships between these variables, providing insights into the economic and social dynamics of G20 nations.

References

[1] Small Arms Survey 2017. Geneva Graduate Institute.

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