Economic Determinants of Gun Violence in the United States: Analysing Socioeconomic Trends and State-Level Disparities

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1.Introduction:

Gun violence is a critical issue in the United States, with significant social, economic, and political implications. Understanding the economic factors that contribute to its prevalence is essential for effective policymaking. This report aims to analyse the relationship between various economic indicators—such as GDP and GDP per capita—and the occurrence of gun violence across U.S. states. The analysis addresses the following research questions:

1. What are the long-term trends in gun violence across U.S. states, and how have they changed over time?
2. How do economic indicators like GDP and unemployment correlate with gun violence rates?
3. Which states exhibit the highest levels of gun violence, and what economic factors are associated with these states?
4. Is there a significant correlation between economic indicators (e.g., poverty, unemployment) and gun violence?

By answering these questions, we aim to shed light on the potential economic drivers of gun violence in the U.S. and provide valuable insights for future studies and policy development.

2.1. Data Sources

In this project, we utilized three key datasets relevant to analysing the correlation between economic indicators and gun violence in the U.S. All datasets are in Zipped CSV format and are directly applicable to our research questions.

- **Gun Violence Data (U.S.)**: Contains information on gun violence incidents across the U.S., including location, date, number of killed and type of violence. The data covers a broad time frame and includes detailed event information.
- **U.S. GDP by State (1997-2020)**: Provides GDP data for each U.S. state from 1997 to 2020, crucial for examining the economic landscape.
- **GDP per Capita by State**: Offers GDP per capita information by state, allowing us to assess economic disparities at the individual state level.

These datasets serve as the foundation for the analysis and allow us to explore the relationship between economic factors and gun violence.

2.2. Data Pipeline

The data pipeline for this project was developed using Python, utilizing various libraries such as pandas, numpy, and SQLAlchemy for data handling, extraction, transformation, and loading (ETL). Below are the key steps involved:

- **Extraction**: The kagglehub library is used to download datasets from Kaggle. Once downloaded, the pipeline extracts the CSV files into memory, which are then processed for further cleaning.

- **Transformation**: Several transformations are performed on the datasets:
    - Removing irrelevant columns.
    - Handling missing data through imputation (mean for numerical columns, mode for categorical).
    - Renaming columns for consistency and clarity.
    - Dropping rows with zero values in critical columns to ensure the accuracy of the data.

- **Loading**: The cleaned and transformed datasets are loaded into pandas DataFrames, merged based on common attributes (e.g., state, year), and stored in an SQLite database for analysis.

This pipeline ensures seamless integration and transformation of large datasets, allowing for efficient analysis.

2.3. Data License

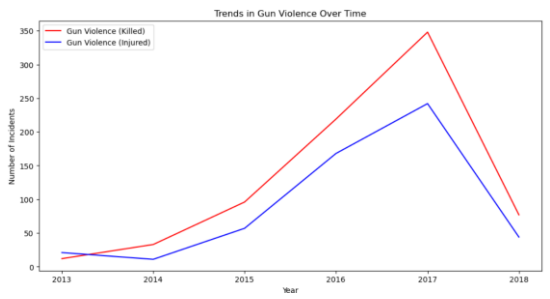
The datasets used in this project, including the Gun Violence Data, U.S. GDP by State, and GDP per Capita by U.S. State, are all licensed Kaggle license. This license permits free use, sharing, and modification of the data, as long as appropriate credit is given to the original source. For this project, the datasets from Kaggle will be transformed and used to explore economic factors influencing gun violence. Proper attribution will be provided in all reports and documentation, in accordance with the license terms.

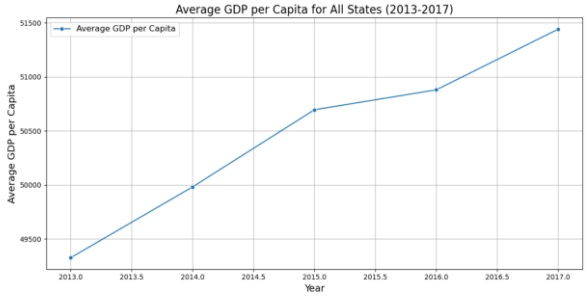
3.Results

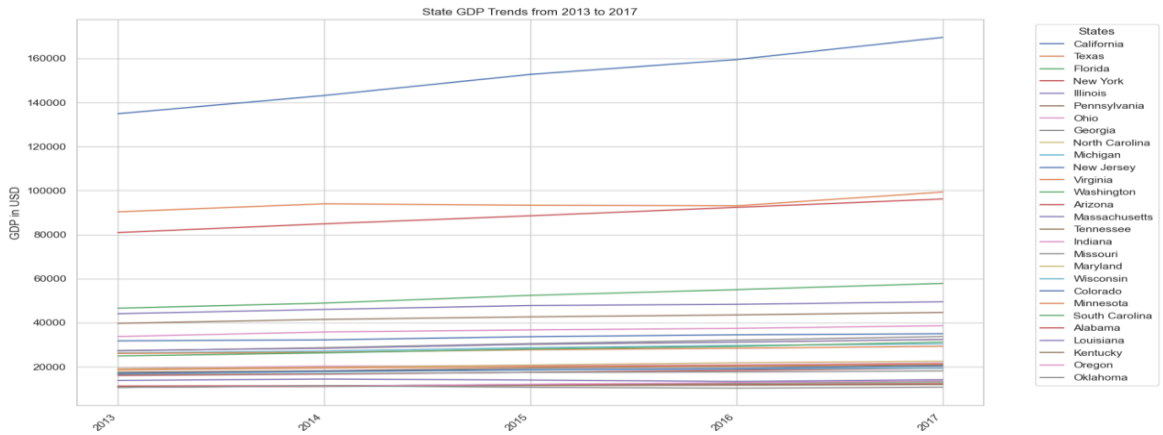
To answer the objective questions, I have used 3 datasets and focused on the years from 2013 to 2017, from the original GDP per state dataset (which has data from 1997 to 2020) as other datasets contains data only from 2013 to 2017.

3.1 Long term trends

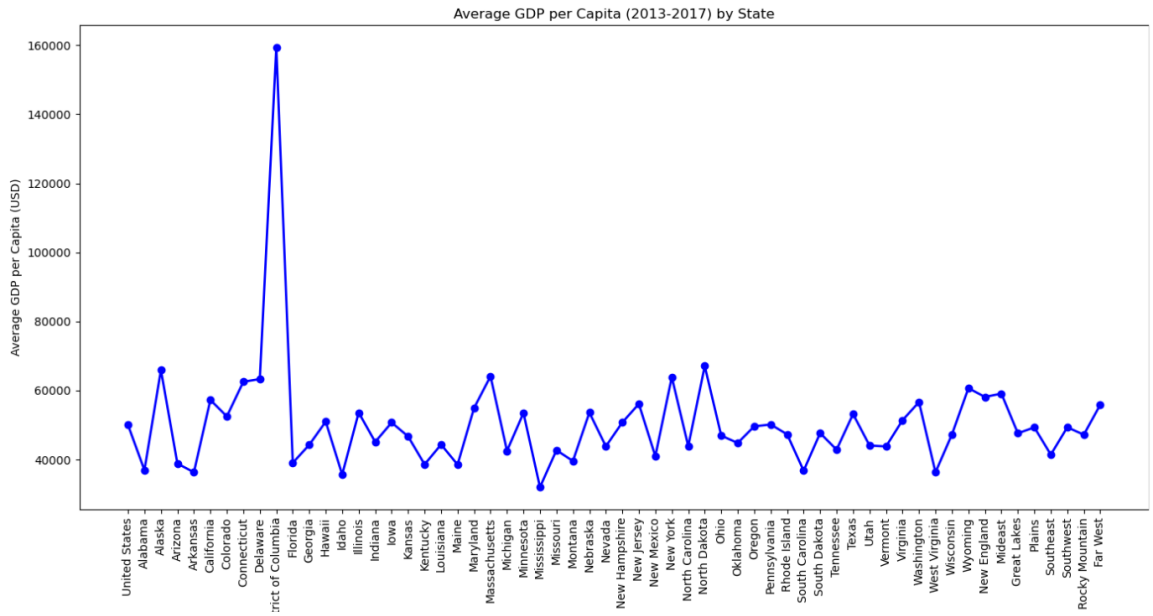
Over the years, gun violence across different states in the United States of America has steadily increased, and both income and state GDP have risen. However, there was dip seen in gun violence in the year 2018 compared to 2017 although the trends of increase in GDP of states and per capita seem to be growing in the steady phase. But bottom 10 states in the US haven't shown any significant increase in the state GDP. Below are trends of Gun violence, state GDP and per capita from 2013 to 2017 (Average).

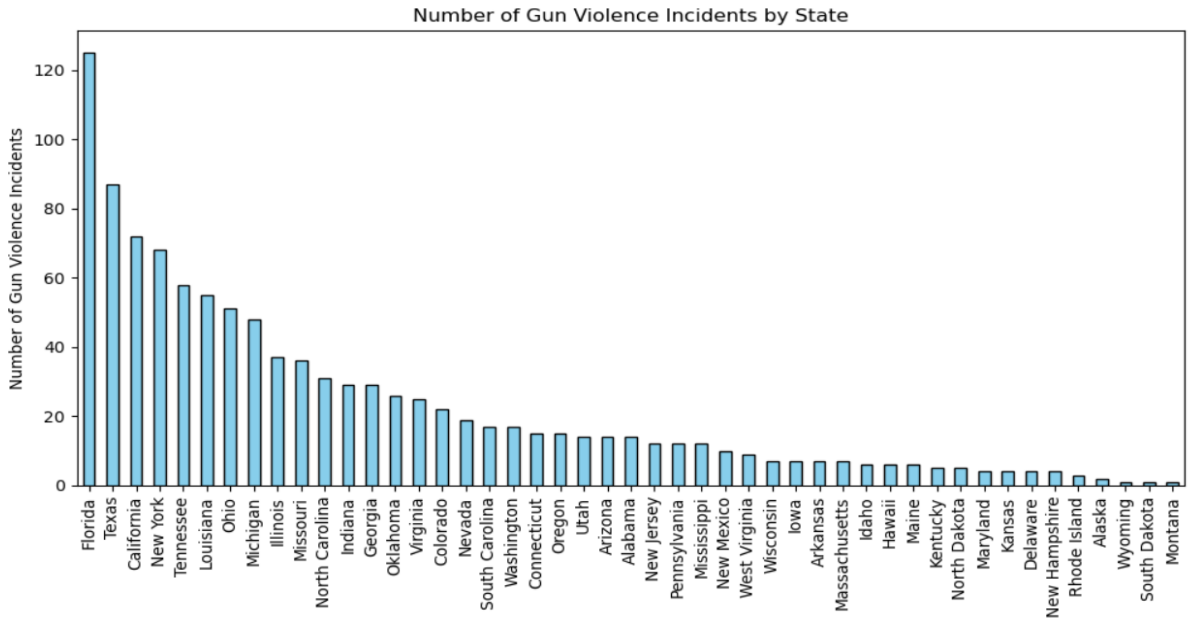




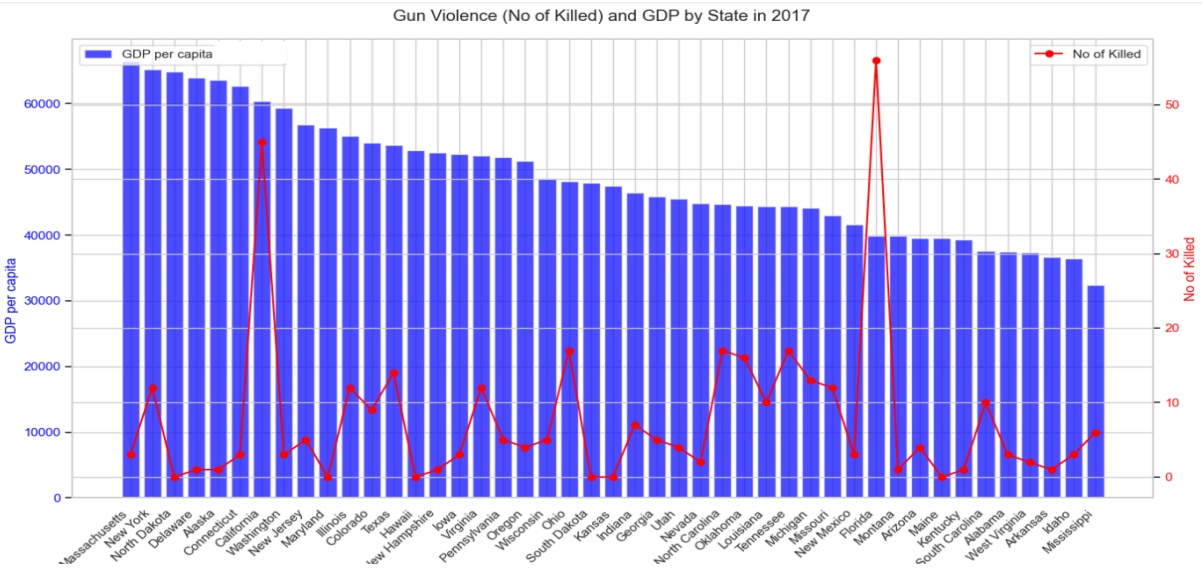


3.2 Now let us look into the GDP per capita of each state and gun violence over the year (2013 to 2017). This gives us more clarity of states where gun violence has occurred and its economic condition. Looking at gun violence, states such as **Florida**, **Texas**, and **California** consistently appear among the top three states with the highest levels of gun violence over the years. These states also have relatively high GDPs, which suggests a potential link between economic factors and the prevalence of gun violence. On the other hand, states like **Wyoming**, **South Dakota**, and **Montana** report some of the lowest gun violence rates in the country. These states also tend to have lower GDPs in comparison to the high-violence states. These 2 plots of gun violence and state GDP can be combined for further analysis (which we can see in the next section 3.3).

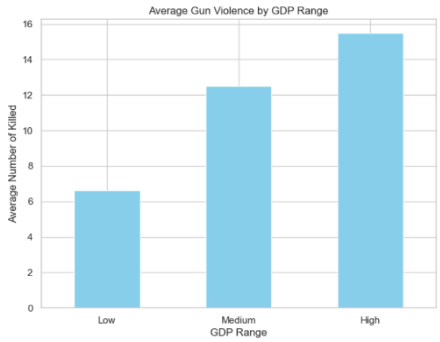




3.4 Now let's combine the data sets in the combination of Gun violence – State GDP per capita and (for making it easier to understand I'll consider year 2017). States like Florida and California have higher gun violence(killed) but the top states with higher per capita like Massachusetts, New York have relatively lower gun violence. This plot does not give intuitive details about the trend but rather a confusing aspect. So better analysis is done further by grouping the states broadly into 3 categories of state GDP (in 3.4).



3.4 Still not able to figuratively conclude that the economic factors are sole responsible for increase in gun violence in the US. But interestingly further analysis by clubbing the states in three categories of incomes showed that the states with high and medium income have more number of reported gun violence than those of low income.



4. Conclusion:

The analysis of Gun violence and state economic factors showed that there is increase in trends of gun violence over the years and even increase in economic indicators but certainly not increasing in the speed in accordance with gun violence. Notably, states like Florida, California, and Texas, which exhibit high levels of gun violence, also have higher state GDPs, though their per capita income levels are similar.

In contrast, states with lower rates of gun violence, such as Wyoming, South Dakota, and Montana, tend to have lower GDPs. While these patterns suggest a possible link between economic factors and gun violence, the relationship is not straightforward. High GDP alone does not fully explain the variations in gun violence rates across states.

But this does not answer the broader question of how economic factors directly impact on the gun violence. Although in the last observation it showed that states with higher and medium GDP had more gun violence, this does not cover bigger picture and does not include every state's detail analysis.

4.1 Limitations:

- The dataset used is insufficient to capture the complex relationship between gun violence and GDP across the states in the US. While GDP offers some insight, other important factors such as population density, the nature of economic activity, and state-level support systems also play a crucial role and should be considered for a more comprehensive analysis.
- Certainly, the most important factor influencing gun violence is the set of laws and regulations governing firearms in each state. Variations in the rules and regulations or leniency of gun laws can have a profound impact on gun violence rates, and the lack of data on state-specific gun regulations represents a significant limitation in this analysis. The laws pertaining to gun should be considered for a more accurate and holistic understanding of the issue.

5. Future work:

- Incorporating of state-specific gun laws and regulations and additional socio-economic indicators such as income inequality, education levels, and healthcare access.
- Beyond economic indicators, the role of social support systems, such as mental health services, social welfare programs, and police interaction, could be explored. The presence or absence of these services may mitigate or exacerbate gun violence, and their inclusion in future studies could offer valuable insights