

Exploring the Correlation Between Unemployment and Crime Rates in MERCOSUR Countries Over Two Decades (2000-2020)

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Introduction

Unemployment is often linked to crime, as economic instability can drive individuals toward unlawful activities. This study examines the relationship between unemployment and crime rates in MERCOSUR countries (Argentina, Brazil, Paraguay, Uruguay, Colombia, Guyana). By analyzing data on unemployment and crime, the research aims to uncover patterns and correlations, offering insights to help policymakers address unemployment-driven crime effectively.

1. Main Analytical Questions:

1. What is the strength and direction of the correlation between unemployment and crime rates in MERCOSUR countries?
2. Is there evidence of causation between unemployment and crime, or is the relationship merely correlational?
3. Does the relationship between unemployment and crime differ across geographic areas within the MERCOSUR region?
4. How have the trends in unemployment and crime rates evolved over time, and are there observable patterns or lagged effects between the two variables?

2. Datasets

The Project utilizes two datasets from the World Bank to provide comprehensive and standardized data for exploring the relationship between unemployment and crime rates across MERCOSUR (Argentina, Brazil, Paraguay, Uruguay, Colombia, Guyana) countries. The zipped CSV format ensures easy handling and compatibility with various analytical tools. The accompanying metadata provides detailed descriptions of indicators, methodologies, and data sources, ensuring transparency and clarity for analytical purposes.

2.1. Unemployment Rates Dataset

- Data : <https://api.worldbank.org/v2/en/indicator/SL.UEM.TOTL.ZS?downloadformat=csv>
- Meta Data: <https://databank.worldbank.org/reports.aspx?source=2&type=metadata&series=SL.UEM.TOTL.ZS>
- Data Type: Zipped
- CSVLicense: [Creative Commons Attribution 4.0 International](#)

This dataset provides annual unemployment rates as a percentage of the total labor force, modeled by the International Labour Organization (ILO). It includes data for countries globally, allowing for cross-country comparisons.

2.2. Crime Rate Dataset

- Data URL: <https://api.worldbank.org/v2/en/indicator/VC.IHR.PSRC.P5?downloadformat=csv>
- Meta Data: <https://databank.worldbank.org/reports.aspx?source=2&type=metadata&series=VC.IHR.PSRC.P5>
- Data Type: Zipped
- CSVLicense: [Creative Commons Attribution 4.0 International](#)

This dataset records annual crime rates measured by the number of intentional homicides per 100,000 people. It serves as a key indicator for analyzing crime levels across different regions.

2.3 Data License

Both datasets are licensed under the Creative Commons Attribution 4.0 International ([CC BY 4.0](#)) license [link](#). Under this license, it allows to freely use the data by copying, sharing, and modifying. So, I am using the datasets from the World Bank and transforming those datasets for our project. Giving proper credits by acknowledging the World Bank as the source of the data and providing a link to the license. This ensures that others know where the data originated from and can access the original source for further information or verification. By complying with these terms, we contribute to open access and encourage the continued sharing and use of valuable data for research, analysis, and innovation. I will make sure that the World Bank receives proper credit in all the reports and documents.

3. Data Pipeline

This section gives a thorough overview of the pipeline, explaining its main parts, the tools used, the changes made to the data, and how we deal with problems or changes in the data's format.

- **pipeline.py** : This orchestrating module brings together the extract, transform, and load components into a cohesive automated pipeline. It defines the sequence of execution, ensuring that each step is performed in the correct order and that dependencies are met.

The pipeline consisted of 3 parts:

- **extract.py**: This Python code is responsible for extracting data from the original sources. The International Labour Organisation and the UN Office on Drugs and Crime's International Homicide Statistics database served as the primary sources for unemployment and crime data, respectively.

- **Paraguay** consistently demonstrates the lowest and most stable unemployment rates across all years, highlighting its economic steadiness.
- **Argentina and Colombia** show significant improvements, with steep declines in unemployment from high levels in the early 2000s.

- **Guyana and Brazil** exhibit more volatility, with notable fluctuations in unemployment rates over the years.
- Uruguay maintains moderate rates, showing economic resilience, especially in the 2010s.
- The global impact of economic events, such as the 2008 financial crisis and the 2020 pandemic, is reflected in rising unemployment rates during these years across most countries.
- **Colombia** stands out with the highest crime rates initially but has shown a remarkable improvement over the years.
- **Paraguay and Argentina** have the lowest and most stable crime rates.
- **Brazil and Uruguay** show moderate crime levels with gradual improvements.
- **Guyana** demonstrates notable variability in crime trends without a consistent pattern.

4.3 Heatmap of unemployment and crime

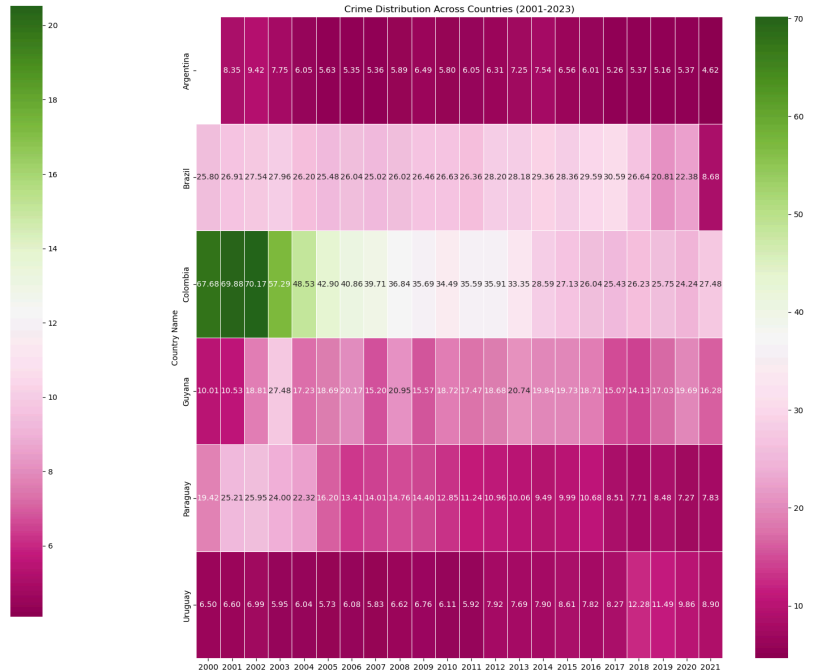
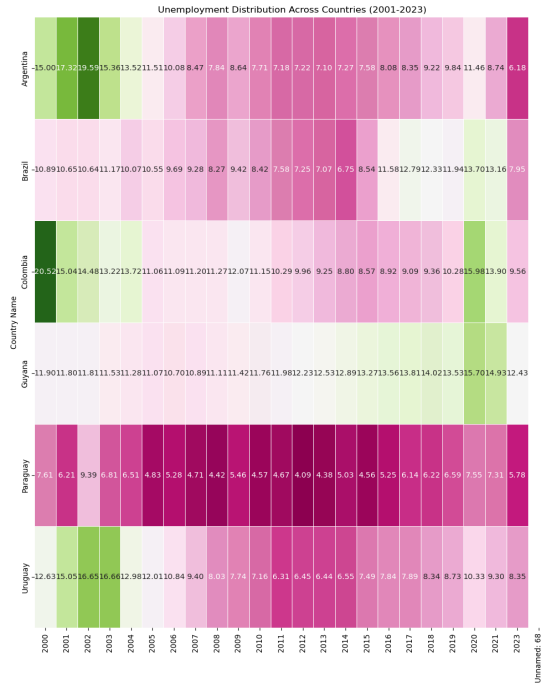


Fig. 3. a)Heatmap for Unemployment data for different countries

Fig.3. b) Heatmap for crime data for different countries

Unemployment

Significant Improvements: Argentina shows the most substantial improvement, with unemployment rates dropping dramatically over two decades.

Stable Trends: Paraguay maintains consistently low unemployment rates, highlighting economic stability.

Moderate Fluctuations: Brazil, Guyana, and Uruguay exhibit moderate fluctuations, with recent improvements post-2020.

Persistent Challenges: Colombia's rates have improved but remain higher than other countries, indicating ongoing economic challenges.

Crime

Colombia: Despite starting with the highest crime rates, it has shown remarkable improvement over the years.

Argentina and Uruguay: Stand out for their low and stable crime rates, reflecting a relatively safe environment.

Brazil: Shows moderate crime rates with some fluctuations, indicating room for improvement.

Paraguay and Guyana: Exhibit steady and relatively low crime rates, with minor fluctuations over time.

4.4. Variability in unemployment and crime rate of different countries using Violin Plot

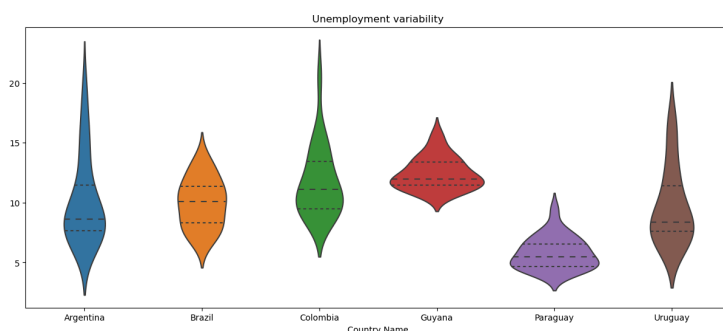


Fig. 4. a) Unemployment Variability

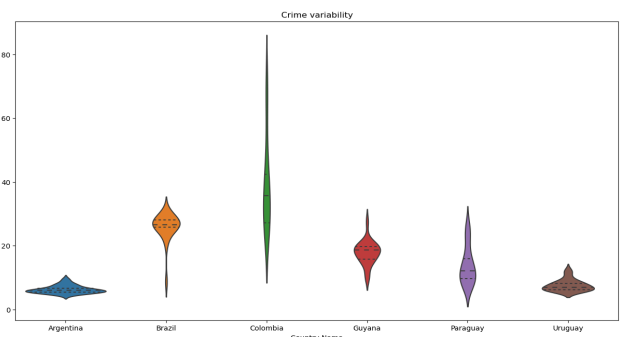


Fig. 4. b) Crime rate variability

Unemployment:

High Variability: **Argentina** stands out with the most variability, indicating significant fluctuations in unemployment over the observed period.

Stability: **Paraguay and Guyana** show the most consistent unemployment rates, reflecting stability in their labor markets.

Moderate Variability: **Brazil, Colombia, and Uruguay** exhibit moderate variability, with unemployment rates showing some fluctuations but remaining relatively balanced.

Crime:

High Variability: Colombia's wide range suggests notable disparities or fluctuations in crime rates.
Stability: Argentina, Uruguay, and Guyana have the most stable crime patterns, with tightly clustered data.
Moderate Trends: Brazil and Paraguay show moderate fluctuations but remain relatively consistent.

4.5 Correlation between unemployment and crime

1.Unemployment and Crime Relationship for Different Countries over the years

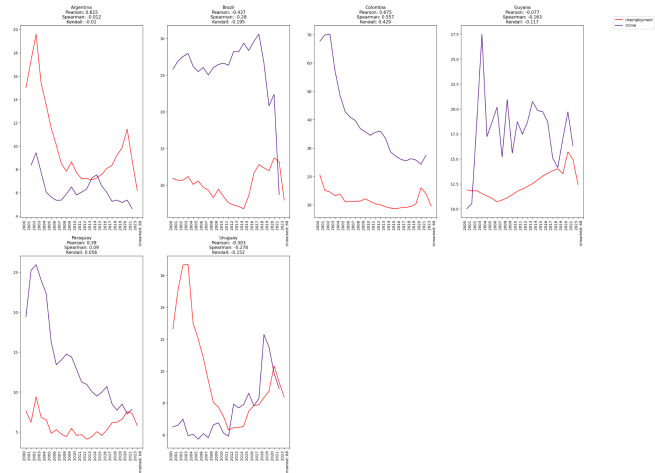


Fig. 5. a) Unemployment & Crime correlation aggregated over the years

2.Unemployment and Crime Relationship for countries in specific year

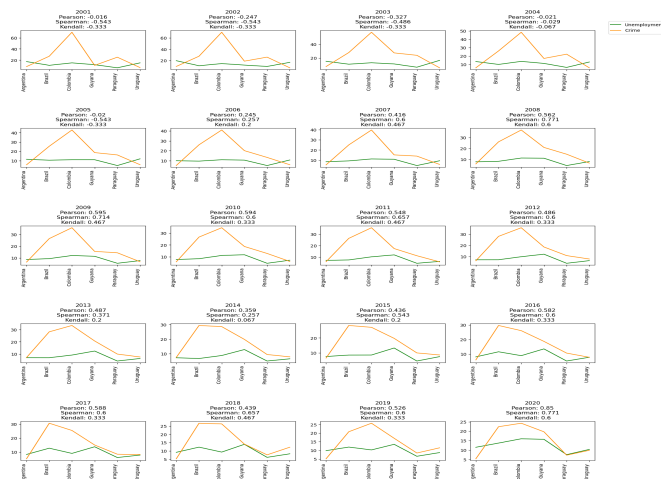


Fig. 5. b) Unemployment & Crime correlation country-wise

- **Positive Correlation:** Argentina and Colombia show that crime decreases with unemployment.
- **Negative Correlation:** Brazil and Uruguay indicate slight crime stabilization or reduction with lower unemployment.
- **Weak Trends:** Guyana and Paraguay show little relationship between unemployment and crime.
- **Strength of Correlation:** The relationship between crime and unemployment strengthens over time, particularly post-2010.
- **Country-Specific Trends:** Colombia and Argentina show the most consistent alignment between the two variables, while Brazil and Paraguay display more variability.
- **Economic Impact:** Years with economic disruptions (e.g., 2020) exhibit stronger correlations, suggesting that unemployment strongly influences crime during such periods.

5. Conclusions:

- Countries like **Colombia** exhibit a strong positive relationship between unemployment and crime, suggesting economic factors significantly influence crime levels.
- **Brazil** and **Uruguay** show a moderate negative relationship, where decreasing unemployment corresponds with declining crime rates.
- **Guyana** and **Paraguay** reflect weak correlations, with stable crime rates less influenced by unemployment fluctuations.
- **Argentina** demonstrates a mixed relationship, indicating additional socio-economic or political factors may play a role in influencing crime trends.

Thus, we can conclude that it is not necessary that if unemployment is high then crime rate will be high and vice versa. Both rates depend on various things like socio-economic factors, political factors, education,, etc.

6. Limitations

Addressing unemployment and crime data limitations can deepen insights into their relationship and inform policy.

Unemployment Data:

- Seasonal jobs (e.g., agriculture) and unpaid caregiving roles often go unrecorded.
- Individuals not seeking work due to barriers (e.g., discrimination or mobility) are excluded.

Crime Data:

- Variations in homicide data sources and societal definitions affect accuracy.
- The analysis might overlook regional variations within countries

Causation vs. Correlation:

Correlation doesn't imply causation; other factors may influence both unemployment and crime.

7. Future works

- **Multifactor Analysis:** Study how policies, education, and the economy jointly impact unemployment and crime.
- **Policy Impact:** Evaluate policies to guide crime prevention strategies.
- **AI Methods:** Apply machine learning to uncover complex patterns.