

# COVID-19's Influence on Global Socio-Economic Landscape

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## Abstract

The global landscape underwent a upheaval shift due to the profound impact of COVID-19 between 2019 and 2023, fundamentally altering societal paradigms. This paper endeavors to meticulously scrutinize the socio-economic dimensions, including migration patterns, taxation policies, unemployment trends, inflationary pressures, Gross Domestic Product (GDP) trajectories and demographic changes engendered by the pandemic. To achieve this, a comprehensive analysis spanning from 2010 to 2023 will be conducted, culminating in a comprehensive assessment of the pandemic's overarching influence around the globe, focusing in the most socio-economic influential countries.

**Keywords:** Big Data, Continents, Countries, COVID-19, Data Analysis, G8, G20, Gross Domestic Product, Inflation, Migration, Population, Taxes, Unemployment

## 1 Introduction

**COVID-19**, also known as the coronavirus disease, is a highly contagious respiratory illness caused by the severe acute respiratory syndrome coronavirus 2 (*SARS-CoV-2*). It was first identified in December 2019 in Wuhan, China, and rapidly spread worldwide, leading to a global pandemic declared by the World Health Organization (*WHO*) in March 2020.

The disease is characterized by a wide range of symptoms, which can vary from mild to severe and include fever, cough, shortness of breath, fatigue, muscle aches, headache, loss of taste and smell, and in more severe cases, pneumonia, acute respiratory distress syndrome, organ failure and death.

**COVID-19** primarily spreads through respiratory droplets from an infected person and by touching contaminated surfaces. The pandemic has been worsened by globalization, affecting healthcare systems globally. Measures like social distancing,

mask-wearing, handwashing and vaccination have been implemented to control its spread, but virus variants and vaccine distribution challenges persist. The pandemic has caused significant public health issues, economic instability, educational disruptions, travel limitations and lifestyle changes worldwide, with varying national responses leading to diverse adverse outcomes.

The main objective of this paper is to analyze the impacts made by the pandemic on various socio-economic factors, including *Gross Domestic Product (GDP)*, *Inflation*, *Migration*, *Population*, *Taxes* and *Unemployment*, on a global scale, aiming to conduct this study with the largest possible number of countries.

Considering the defined main objective, the associated research questions are:

1. How has the COVID-19 pandemic affected employment rates, income inequality, poverty levels, consumer behavior, spending patterns, global economic growth and GDP per capita?
2. How do the impacts of COVID-19 on inflation, migration, population, GDP, taxes and unemployment compare between G8 countries and non-G8 countries?
3. How do the socio-economic impacts of the COVID-19 pandemic differ across various continents during this global crisis?

The paper is organized as follows: Section 2 defines the socio-economic measures under study, whom are stated above. Section 3 analyzes recent literature on the impact of COVID-19 on these socio-economic aspects across different regions. Section 4 describes the datasets used and their importance in achieving the study's objectives. Section 5 details the pre-processing and merging of these datasets, resulting in the final dataset for analysis. Section 6 presents the analysis of the processed data, highlighting COVID-19's impact on each socio-economic measure with data visualizations. Section 7 interprets the results in relation to the research questions and compares them with other studies. Finally, Section 8 summarizes the study's main contributions and suggests areas for future research.

## 2 Definition

In this section, we define and discuss the key indicators relevant to our study: **Gross Domestic Product**, **Inflation**, **Migration**, **Population**, **Taxes** and **Unemployment**. These measures are crucial for understanding the comprehensive impact of the COVID-19 pandemic across different regions, providing a foundation for our analysis of their variations and the ensuing socio-economic consequences.

### 2.1 Gross Domestic Product

**Gross Domestic Product** is the total market value of all finished goods and services produced within a country during a specific time period, serving as a comprehensive indicator of a country's economic health. [1] It includes private and public consumption, government spending, investments and the foreign balance of trade. [2] The foreign balance of trade, a crucial component, influences GDP significantly; a trade surplus increases GDP, while a trade deficit decreases it.

## 2.2 Inflation

**Inflation** refers to the rise in prices over time, leading to a decline in the purchasing power of money. It measures the overall impact of price changes for a diversified set of goods and services, reflecting the average price increase in an economy. [3] Inflation impacts the cost of living, reducing the amount of goods and services one unit of currency can buy, and can decelerate economic growth if it outpaces economic productivity. [4]

## 2.3 Migration

**Migration** refers to the movement of individuals either across international borders or within a country for a period exceeding one year, regardless of the cause or means of migration. Migration significantly impacts socio-economic measures such as population dynamics, labor markets, GDP, taxes and unemployment. [5]

## 2.4 Population

**Population** encompasses all nationals present in or temporarily absent from a country, as well as permanently settled non-nationals. It indicates the number of people usually residing in an area and is measured through censuses. [6]

## 2.5 Taxes

**Taxes** are mandatory contributions imposed on individuals or corporations by government entities at various levels to finance public services and programs. [7] Taxes affect economic activities by determining who bears the tax burden, whether businesses or consumers. [8]

## 2.6 Unemployment

**Unemployment** is defined by the Organisation for Economic Co-operation and Development (*OECD*) as individuals above a specified age who are not in paid employment or self-employment but are currently available for work. It is typically measured by the unemployment rate, which is the ratio of unemployed individuals to the total labor force. [9]

These features are crucial to our study, providing the framework to analyze the socio-economic impacts of the **COVID-19** pandemic. Understanding these concepts allows us to examine the pandemic's effects on economic performance, demographics, labor markets, and fiscal policies across regions, enabling meaningful comparisons and global insights.

## 2.7 G8 Countries

The **Group of Eight (G8)** is an intergovernmental political forum composed of eight of the world's major advanced economies: the United States, the United Kingdom, France, Germany, Italy, Canada, Japan, and Russia. Established to foster dialogue and coordinate policies on economic and political issues of mutual concern, the *G8* plays

a important role in global governance. The *G8*'s primary activities revolve around annual summits where leaders gather to discuss and strategize on global economic policies, trade, climate change, security and other pressing international issues. These summits provide a platform for the world's leading economies to address common challenges, seek consensus, and promote cooperative solutions.

## 2.8 G20 Countries

The **Group of Twenty (G20)**, established in 1999, is an international forum of 19 countries and the European Union, representing around 85% of global **GDP**, over 75% of international trade, and about two-thirds of the world's population. Initially focused on economic issues, the G20 has expanded to address climate change, global health, and sustainable development. Leaders meet annually at summits, supplemented by finance ministers, central bank governors, and working group meetings, to foster international cooperation and address global economic stability and growth.

# 3 State of the Art

In this section, we review existing literature and recent studies on the impact of the **COVID-19** pandemic on various socio-economic measures.

## 3.1 Search Criteria

**Research Strategy** The research strategy for this paper is to find relevant articles that have been published on trusted platforms such as *Google Scholar*. *Google Scholar* is a research platform that gathers scholar literature from different libraries into one search engine were one can search for various topics, disciplines and sources. The articles were selected by reading titles and abstracts to decide their relevance for the research question. To complement this strategy an organized search will be conducted where the following keywords will be searched for: *COVID-19, Socio-Economic, Gross Domestic Product, Inflation, Migration, Population, Taxes and Unemployment*.

**The Selection of Articles** The selected literature is analyzed to determine the quality of the papers. To check the quality, a checklist was used that examined the following aspects:

- **Value:** The chosen literature needs to bring value to the research, meaning that it must describe necessary aspects regarding the topic under investigation, contributing significantly to the overall understanding.
- **Readability:** The chosen literature should be well-structured, have a logical sequence of content, and be written in English.
- **Accuracy:** The chosen literature should not be older than 10 years. The reason for this is because findings of older literature will not be useful due to the fast-developing technology. That implies that the emotion technology that was used 10 years ago, may not have the same advantages and disadvantages as more recent technology has today. Therefore, the answer to the research question might differ depending on the age of the literature.

**Presentation of Research** The research will be comprehensively summarized in the results section of the paper. It will cover the impacts of the COVID-19 pandemic on key socio-economic measures, including GDP, Inflation, Migration, Population, Taxes, and Unemployment. Additionally, there will be a discussion on the comparative analysis between the G8 countries as well as a comparison across different Continents. Finally, a summary will encapsulate all the significant findings and insights derived from the study.

### 3.2 Quick Overview of Recently Research

The **COVID-19** pandemic has had far-reaching effects on global economies, with significant variations across different regions and countries. This comprehensive analysis synthesizes findings from various academic and institutional sources to present an in-depth overview of the impacts on GDP, inflation, population dynamics, migration patterns and fiscal policies. These studies offer a comprehensive context for our comparative analysis of the G8 countries and continents.

#### 3.2.1 Gross Domestic Product

The impact of **COVID-19** on **GDP** has been significant globally. Research by the Brookings Institution highlights the crucial role of fiscal policies, including government spending and tax relief measures, in mitigating economic downturns during the pandemic. Without these interventions, **GDP** levels would have been significantly lower. [10] Complementing this, the Federal Reserve's analysis found that countries implementing substantial fiscal stimulus experienced higher **GDP** growth rates, though this was coupled with increased inflationary pressures. [11] In addition, the International Monetary Fund (*IMF*) pointed out that timely and substantial fiscal measures supported economies more effectively, reducing **GDP** contractions. The *IMF* also noted regional variations, with advanced economies generally managing better than developing ones due to greater fiscal space and financial resources. [12]

#### 3.2.2 Inflation

Inflation dynamics during the **COVID-19** pandemic have varied significantly across regions. The Federal Reserve's study indicated that large fiscal stimulus boosted demand without corresponding production increases, contributing to inflation. [11] Similarly, research in Public Library of Science (PLoS) ONE highlighted that aggressive fiscal policies and high global trade exposure led to pronounced inflationary pressures in several countries such as Spain, Turkey and New Zealand. [13] Furthermore, Multidisciplinary Digital Publishing Institute (*MDPI*) research on African countries revealed that supply chain disruptions and economic policies aimed at mitigating the pandemic's effects also drove inflation rates higher. [12] The European Central Bank (*ECB*) added that pandemic-induced supply chain disruptions and shifts in demand patterns caused temporary spikes in inflation rates across many European countries. The *ECB* emphasized the need for coordinated fiscal and monetary policies to effectively manage these inflationary pressures. [14]

### **3.2.3 Migration**

The pandemic has profoundly affected migration patterns. Studies by the European Commission and the *OECD* highlighted how travel restrictions and economic uncertainty significantly slowed migration rates, impacting labor markets and demographic trends. [15] The World Bank observed significant declines in remittance flows, exacerbating economic challenges in developing regions. [16] Research in the Journal of Migration Studies emphasized the long-term implications of these disruptions, suggesting that the pandemic could lead to lasting changes in global migration patterns, potentially altering labor supply and demographic structures for years to come. [15]

### **3.2.4 Population**

The pandemic's impact on population dynamics is evident in changes in birth and death rates, as well as migration trends. Reports from the *OECD* and United Nations highlighted that higher mortality rates due to COVID-19 temporarily slowed population growth in some regions, such as North America and the Eurozone. Disruptions in migration patterns have also affected population distributions, with significant implications for labor markets and economic development. [12] The World Health Organization (*WHO*) noted that increased mortality rates, particularly among older populations and those with pre-existing conditions, affected population growth rates. Additionally, the WHO indicated that disruptions in healthcare services could lead to long-term health impacts affecting population demographics. [17]

### **3.2.5 Taxes**

Fiscal responses to the pandemic have significantly influenced tax policies and revenues. The Brookings Institution and *IMF* highlighted how increased government spending and tax relief measures were essential for economic support during the pandemic. However, these interventions have led to higher public debt, impacting future tax policies and fiscal sustainability. [10] [18] The *OECD* reported that many countries implemented tax deferrals and reductions to support businesses and individuals, helping to mitigate the economic impact but leading to substantial declines in tax revenues. The *OECD* stressed the importance of sustainable fiscal policies to manage increased debt levels resulting from these interventions. [13]

### **3.2.6 Unemployment**

Unemployment trends during the pandemic have shown significant fluctuations. The Richmond Federal Reserve's analysis found that unemployment rates spiked dramatically in early 2020 but have since gradually recovered, with labor force participation rates remaining below pre-pandemic levels, especially among younger and less-educated workers. [19] The International Labour Organization (*ILO*) highlighted that the pandemic led to unprecedented job losses, particularly in sectors such as hospitality, retail and travel. The *ILO* emphasized the importance of targeted support measures to facilitate labor market recovery and address disparities in unemployment impacts across different demographic groups. [20]

### 3.2.7 G8 Countries Analysis

The socio-economic impacts of the pandemic have varied significantly between the *G8* countries and other regions. Studies by Brookings and the Federal Reserve revealed that *G8* nations, with their robust fiscal and healthcare systems, were generally more effective in mitigating the economic fallout of the pandemic. Rapid fiscal responses helped stabilize **GDP** and control inflation more effectively than in many non-*G8* countries. However, these nations also faced challenges, such as managing higher debt levels due to extensive fiscal support measures. [10] The IMF compared the economic recovery trajectories of *G8* countries with other advanced economies, finding that *G8* countries generally experienced quicker recoveries due to their greater fiscal capacity and extensive public health measures. The study highlighted the role of coordinated international responses in supporting global economic stability during the pandemic. [18]

### 3.2.8 G20 Countries Analysis

The *G20* countries, representing the world's largest economies, also exhibited varied responses to the pandemic. Research indicated that *G20* nations with significant fiscal space and strong public health systems managed to mitigate economic declines more effectively. The Asian Development Bank (*ADB*) noted that Asian *G20* countries like China and South Korea implemented rigorous public health measures and substantial fiscal stimulus, resulting in quicker economic recoveries compared to other regions. [21] Studies by the *OECD* highlighted that *G20* countries with coordinated fiscal responses and robust economic policies saw a more stable **GDP** growth trajectory, despite facing higher public debt levels. The *OECD* stressed the importance of continued international cooperation to manage economic recovery and sustainability. [22]

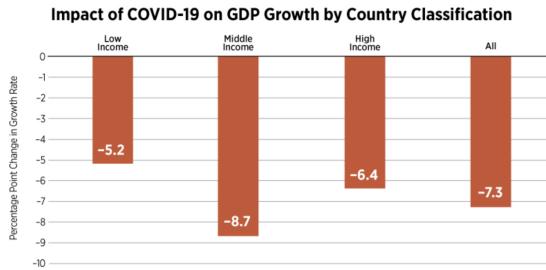
### 3.2.9 Continental Analysis

The impact of **COVID-19** also varied across continents. In Africa, the pandemic exacerbated existing economic vulnerabilities, leading to significant declines in **GDP** per capita, increased unemployment and higher inflation rates. These effects were unevenly distributed, with some countries (such as Myanmar and Bangladesh) experiencing more severe impacts due to factors like population density and healthcare capacity. [12] In contrast, European and North American countries generally experienced quicker economic recoveries, aided by substantial fiscal interventions and advanced healthcare systems. However, these regions also faced higher inflation rates due to increased consumer demand and supply chain disruptions. [13] A study by the Asian Development Bank (*ADB*) found that Asian countries experienced varied economic impacts, with some nations recovering quickly (Singapore and Mongolia being two examples) due to effective public health measures and fiscal support, while others (like Uzbekistan and Vanuatu) faced prolonged economic challenges due to less robust healthcare systems and limited fiscal capacity. [21]

### 3.2.10 Visualization of the Impact

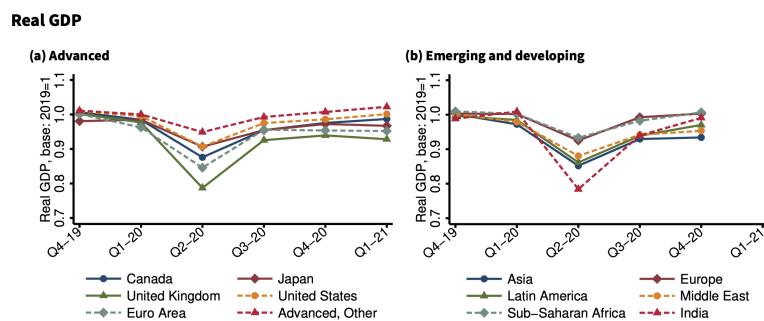
To provide a clearer understanding of these impacts, we included the following charts from the analyzed studies.

**Impact of COVID-19 on Global GDP:** The chart in the Figure 1 from the St. Louis Fed's article on "The Economic Impact of COVID-19 around the World" illustrates how the pandemic severely impacted GDP growth across different income groups. The analysis focuses on the shock's effects on low, middle and high income countries, showing significant differences in GDP growth and recovery trajectories. [23] With this chart we can conclude that the *COVID-19* pandemic impacted the GDP of all countries, despite their income, with a heavier toll on the middle income countries.



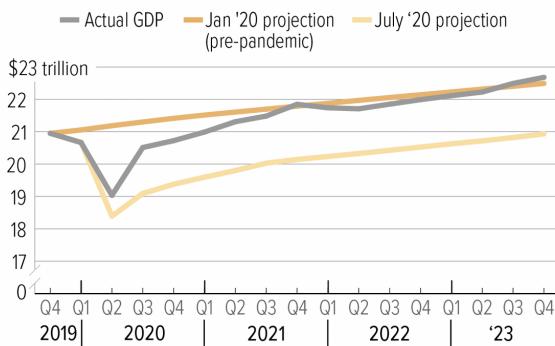
**Figure 1** GDP Variation on Different Income Groups of Countries

**Impact of COVID-19 on GDP per Countries and Continents:** The chart in the Figure 2, also from the same article shows the quarterly changes in real GDP from 2019 to 2021 for both advanced and emerging/developing economies. This chart effectively highlights the disparate economic impacts and recovery patterns of the **COVID-19** pandemic across different regions and income groups, providing a clear visual representation of the global economic disruption and subsequent recovery. By analysing this chart we concluded that every country and continent, despite being advanced or in development (emerging) had their GDP considerably affected by the **COVID-19** pandemic.



**Figure 2** GDP Variation on Different Countries and Continents

**Impact of COVID-19 on GDP and the Respective Projections:** The chart in the Figure 3 from the Center on Budget and Policy Priorities (**CBPP**) article "Tracking the Recovery from the Pandemic Recession" represents the trajectory of actual **GDP** compared to pre-pandemic and mid-pandemic projections. It provides valuable insights into the economic impact of **COVID-19** and the effectiveness of recovery efforts, supporting the analysis of how different projections evolved and the real economic outcomes observed. [24] With this chart we can conclude that in the beginning of the **COVID-19** pandemic the global GDP took a drastically fall, however it slowly adapted to the situation and even surpassed the **GDP** pre pandemic.

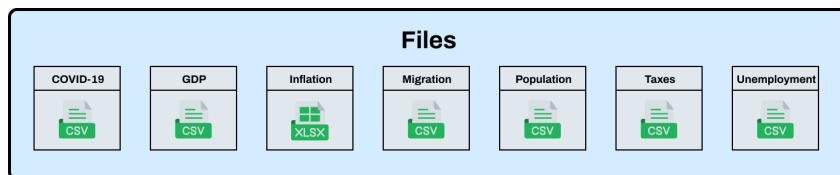


**Figure 3** GDP Variation and Projections

## 4 Data Breakdown

This section provides a comprehensive overview of the datasets essential for analyzing socio-economic dynamics, covering the period from 2010 to 2023, including the **COVID-19** pandemic period.

As depicted in Figure 4, a selection of seven datasets was made, comprising six in *CSV* format and one in *XLSX* format.



**Figure 4** Dataset Files

### 4.1 Search Criteria

The selection of datasets for this study was based on several key criteria to ensure comprehensiveness, accuracy and relevance. Below is a list of said criteria.

1. **Relevance to the Problem Domain:** The datasets are directly relevant to the overarching problem domain, offering insights that are instrumental in addressing the research questions.
2. **Size and Variety:** The datasets selected are large to qualify as *Big Data* and can provide insights at scale.
3. **Data Quality:** The selected dataset exhibits a low quantity of missing data, indicating high consistency and reliability. Ensuring data quality is crucial, as low-quality data can lead to inaccurate analyses and misleading insights, undermining the validity of the findings.

## 4.2 Selected Datasets

In this section, we detail the datasets chosen for our study, emphasizing their relevance, comprehensiveness and credibility.

**COVID-19:** This dataset offers a comprehensive overview of the **COVID-19** pandemic, encompassing vital information such as confirmed cases, deaths, recoveries and a range of other pertinent metrics across the globe. [25]

**Gross Domestic Product:** This dataset encompasses **GDP** data across various countries from 1980 to 2028, including forecasts. It's designed for analyzing global economic trends, comparing countries, and understanding economic growth patterns. The data is sourced from the International Monetary Fund (*IMF*), ensuring reliability for economic research or predictive modeling. [26]

**Inflation:** This dataset that provides the annual inflation rate based on the average consumer price index changes for a range of countries from 1980 to 2028. The dataset has a list of countries as rows and years as columns. For each country and year, the dataset indicates the percentage change in inflation. [27]

**Migration:** This dataset contains the net migration for various countries and regions. Net migration is the number of immigrants minus the number of emigrants over a period, which in this dataset spans from 2000 to 2025. Each row specifies a country or region and the columns include the series name 'Net migration', the series code, the country name, the country code, and the net migration figures for each year. [28]

**Tax:** This dataset that contains tax revenue as a percentage of **GDP** for various countries from 1960 to 2022. Each row represents a different country or region and the columns include the country name, country code, the indicator name and the yearly data for the indicator. [29]

**Population:** This dataset includes the total population for a selection of countries and regions over a span of years from 2000 to 2024. Each row represents a different country or region, with columns detailing the country name, country code and the population for each year. [30]

**Unemployment:** This dataset contains the unemployment rates, which represent the total number of unemployed individuals as a percentage of the total labor force for various countries and regions from 1960 to 2022. The dataset includes the country

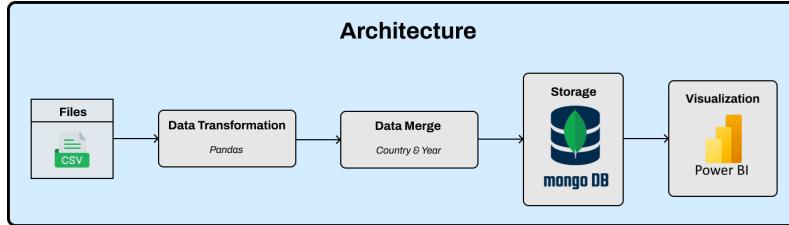
name, country code, the indicator name Unemployment and total (% of total labor force). [31]

## 5 Methods

This section outlines the architecture of the implemented system, starting with the selection of relevant columns from the datasets to align with the research objectives. The pre-processing phase addresses missing values to ensure data integrity and is followed by merging datasets to create a unified analytical framework. A comparative analysis of Pandas and Apache Spark is conducted to evaluate their efficiencies in handling large datasets and complex transformations. The data is stored in **MongoDB**, a scalable and flexible **NoSQL** database. Finally, the data migration process from the pre-processed datasets to MongoDB is detailed, along with the subsequent export to **Microsoft PowerBI** for advanced visualization and analysis, ensuring a robust and efficient data pipeline.

### 5.1 Architecture

The architecture employed in this project incorporates all datasets detailed previously. Initially, each dataset undergoes individual pre-processing using the **Pandas** library, involving data cleaning, addressing missing values, format conversion to better encapsulate the data, and normalization of data formats. Post pre-processing, the datasets are merged into a unified dataset to enable comprehensive analysis. The consolidated data is then stored in a **MongoDB** database, selected for its flexibility and scalability in managing large, diverse datasets. The final step involves exporting the data from **MongoDB** to **Microsoft PowerBI**, facilitating the creation of dynamic dashboards and visualizations. These visual tools aid in the detailed analysis and presentation of data insights. Figure 5 illustrates the architecture, depicting the workflow from data extraction and pre-processing to visualization.



**Figure 5** Architecture

### 5.2 Pre-Processing

**Pre-Processing** is a crucial step in this project as it ensures data quality and consistency. The data is cleaned, transformed, and prepared for analysis. Each dataset that represents socio-economic variables follow a similar Pre-Processing method due to

their similar structure. These datasets include columns for country, year, and the relevant socio-economic variable. As for the **Covid-19** dataset, it has a slightly different approach as it contains the information per day instead of per year.

The first task involves loading the data into a DataFrame from a *CSV* file, with a timer set to measure the total preprocessing time. Each dataset is reshaped from a wide format to a long format using the melt function, which converts year-specific columns into individual rows, resulting in a dataset with three primary columns: country, year, and the socio-economic variable. This transformation facilitates easier data manipulation and analysis.

As for the **Covid-19** dataset, the date column is converted to a datetime format for accurate grouping and manipulation. Then, the dataset is grouped by location and year, selecting the last record of each year to capture cumulative cases. A new column for the year is then created from the date column. This extra steps for this particular dataset are taken for it to take the same format as the other datasets by the end of the Pre-Processing.

After reshaping, the DataFrame is sorted by country and year to organize the data chronologically. The columns are renamed to more intuitive names to enhance readability. Standardizing country names ensures consistency across the dataset, addressing discrepancies and facilitating reliable data analysis. Aggregated entries and non-country entities are removed, focusing the dataset solely on individual countries. Finally, the cleaned and processed dataset is saved to a new *CSV* file, ensuring a uniform format for subsequent merging.

### 5.3 Merging the Datasets

After Pre-Processing, the datasets are merged to obtain a single dataset encompassing all variables. The merge process begins by reading the preprocessed *CSV* files into separate DataFrames. Each DataFrame is filtered to include only the years between 2010 and 2023, ensuring relevance to the study period. The DataFrames are then merged using outer joins on the *country* and *year* columns, preserving all data points from each dataset. The merged DataFrame is sorted by country and year, and certain non-country entities are removed to maintain focus on individual countries. Standardized country names and handling of missing data ensure consistency and accuracy. The final merged DataFrame is saved to a new *CSV* file, ready for analysis.

### 5.4 Pandas Vs Spark

The Pre-Processing of multiple datasets was approached using both the **Pandas** Library and the **Apache Spark** Framework to evaluate their efficiency. **Pandas** is well-suited for handling small to moderately sized datasets in-memory, while **Spark** is designed for large-scale data processing using distributed computing. To compare execution times, the pre-processing steps were consolidated into a single notebook to reduce the overhead of multiple session initializations. The results showed that **Pandas** executed in 1.314 seconds, significantly faster than **Spark**'s 14.703 seconds, making **Pandas** the more efficient choice for this project.

## 5.5 MongoDB

**MongoDB** is a NoSQL database known for its flexibility, scalability, and performance, making it suitable for handling unstructured and semi-structured data. Its document-oriented storage, schema flexibility, and support for rich queries make it ideal for managing large and diverse datasets. Compared to **Cassandra**, **MongoDB** offers more adaptability to changing data schemas and better querying capabilities. Unlike **Hadoop**, which excels in batch processing, **MongoDB** is optimized for real-time queries and analytics, providing a more straightforward approach to database management.

The data extraction process involves connecting to a local MongoDB server and specifying the target database and collection. The merged *CSV* file is read into a pandas DataFrame, converted into a list of dictionaries, and inserted into the **MongoDB** collection. This ensures an efficient transfer of data, facilitating further analysis and querying.

## 5.6 PowerBI

**PowerBI** is a business analytics tool that enables users to visualize and share insights from their data. It provides interactive visualizations and business intelligence capabilities, making it versatile for data analysis. **PowerBI** was chosen for its robust visualization capabilities and ease of integration with multiple data sources, including **MongoDB**. To import data from **MongoDB** into **PowerBI**, the ODBC driver from Devart was used. This process involves configuring the *ODBC* connection and setting up the data source name (*DSN*) in **PowerBI**. The data from **MongoDB** is then accessible within **PowerBI**, allowing for dynamic dashboards and detailed data analysis.

# 6 Results

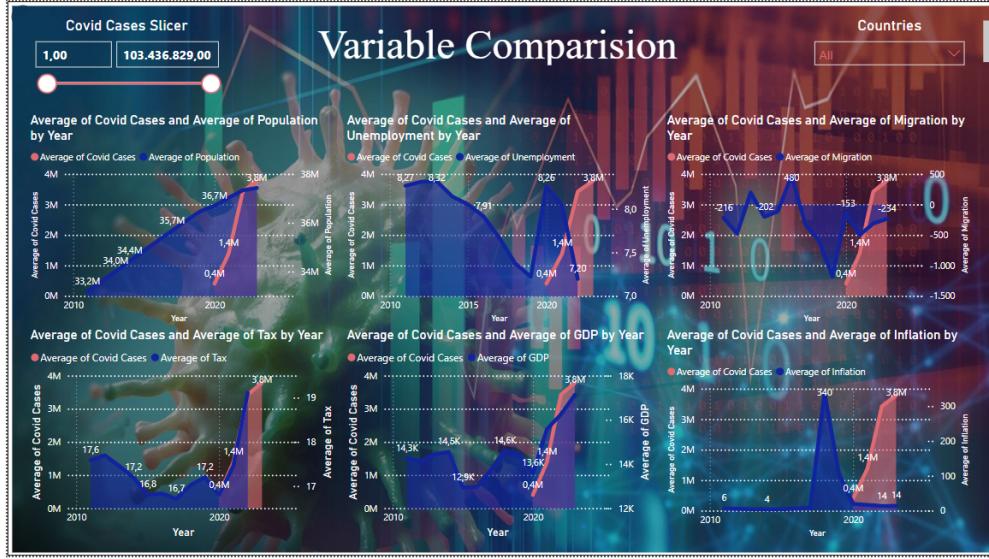
After importing the data into **PowerBI**, we created dashboards to explore and extract insights about the data and their relationships.

## 6.1 Variable Results

Regarding the variables from a global perspective, as shown in Figure 6, the study concluded that the onset of COVID-19 had a significant impact on several economic parameters. For instance, the average GDP of each country increased from around 12k-14k to 17k in 2023. In terms of inflation, there was a notable rise during the pandemic compared to the values recorded between 2010 and 2017, which ranged from 4% to 8%, with rates surging to between 14% and 19% during the COVID-19 years. However, none of these figures compare to the inflation peak in 2018, where the average inflation rate soared to 340. This peak was primarily due to Venezuela, which experienced hyperinflation because of severe economic mismanagement, declining oil prices, and political instability.

Similarly, the emergence of COVID-19 led to an increase in the average number of Migrations, rising from about -1200 to nearly neutral (150). However, the following

year, the number oscillated, dropping to -500. In the case of Population, the pandemic had little effect, as the population consistently increased from 34 million in 2010 to approximately 38 million in 2023. Taxes, which varied between 17 and 16 before COVID, reached a new high of over 19 in 2023. Finally, Unemployment, which had been decreasing since 2013, from 8.32 to 7.22 (2019), rose again in 2020 to 8.26% due to the global lockdowns. However, in the subsequent years, it resumed its downward trend, reaching a record low of 7.2 in 2023, the lowest since 2010.



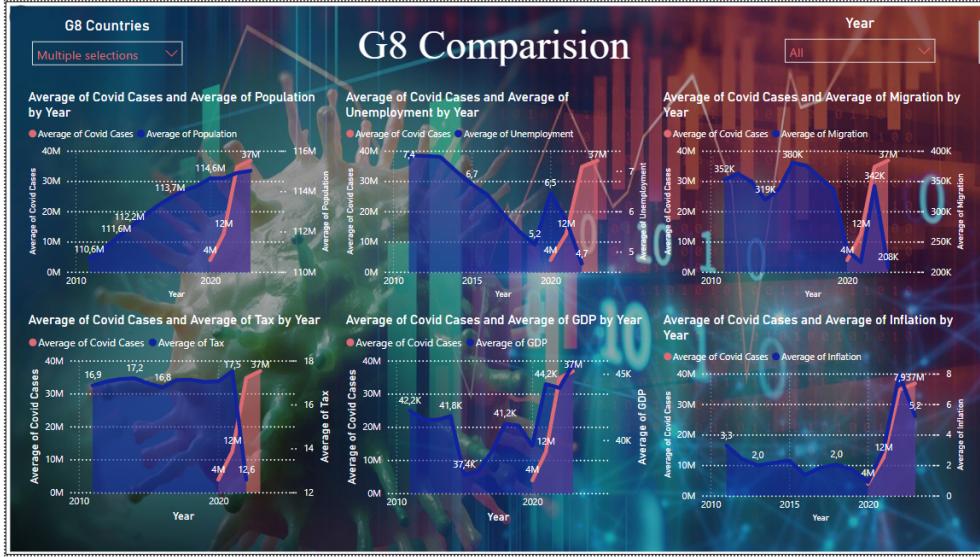
**Figure 6** Dashboard Globally Variable Comparision

## 6.2 G8 Results

Focusing now on the G8 countries, we can observe a similar trend to the global case. There was a significant drop in GDP during the first year of the pandemic, with values reaching 39.5k compared to 40k or more in previous years. However, in the following years, there was a substantial increase, culminating in a peak in 2023 at 45k, the highest since 2010. Regarding Inflation, there was a notable difference; between 2010 and 2020, inflation rates ranged from 3.3% to 0.89%. With the onset of COVID-19, this rate surged to unprecedented levels, peaking at 7.94% in 2022. By 2023, it had decreased to 5.2%.

Migration was another factor that saw significant changes. Since 2016, Migration numbers had been declining from 380k to 216k in 2021. However, in 2022, there was a sharp increase back to 342k, followed by a drop to the lowest average since 2010, at just 208k. In terms of Population, there was little change compared to previous years, with an average increase of about 10 million people from 2010 to 2023.

Regarding Taxes, significant differences were observed. Before the pandemic, tax values ranged from 16% to 18%. However, in 2022, there was an abrupt drop to an unprecedented 12.6%, reflecting the severe impact of the disease in the G8 Countries. Finally, Unemployment followed a similar trend, peaking at 6.5% in 2020, the first year of the pandemic, and then decreasing in the following years to a recent low of 4.7%.



**Figure 7** Dashboard G8 Variable Comparison

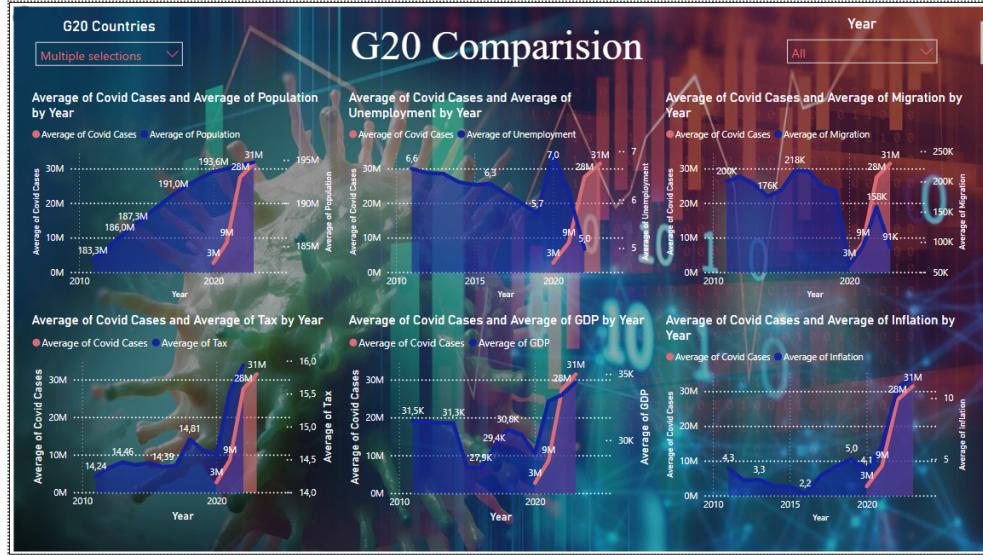
### 6.3 G20 Results

After conducting an in-depth study on the G8, we decided to include the G20 as well. As previously mentioned, the G20 consists of the world's 20 largest economies. Our aim was to determine if the impact on economies outside the G8 differed or if they followed the same pattern. As observed in Figure 8, the recorded values for both the G20 and the G8 show little variation. The only notable difference was in the average tax rates. In the case of the G8, this value decreased significantly from 2020 to 2022, while in the G20, there was an increase from 14.58% to an unprecedented 15.93%, compared to the pre-pandemic values ranging from 14.24% to 14.81%.

### 6.4 Continents Results

Finally, we were able to conclude the impact of the pandemic on each continent and determine which ones were most affected. The dashboard used, was similar to the previous ones, but we used the Filter to select each individual continent (Figure 9).

The **GDP** values during the pandemic followed a similar trend across all countries. In the pre-pandemic years, especially from 2014 to 2016, the GDP reflected the global



**Figure 8** Dashboard G20 Variable Comparision

economy on a large scale, with one of the main reasons being [? ]. For example, Europe's GDP was 33.4k in 2014, but it fell to below 30k in the following two years. In the first year of the COVID-19 pandemic, a drop in the economy occurred worldwide, with all continents showing a decline from 2019 to 2020. However, in the following years, there was a significant increase in GDP, with most countries reaching record values. For instance, Asia's GDP rose from 12k in 2020 to almost 16k in 2023.

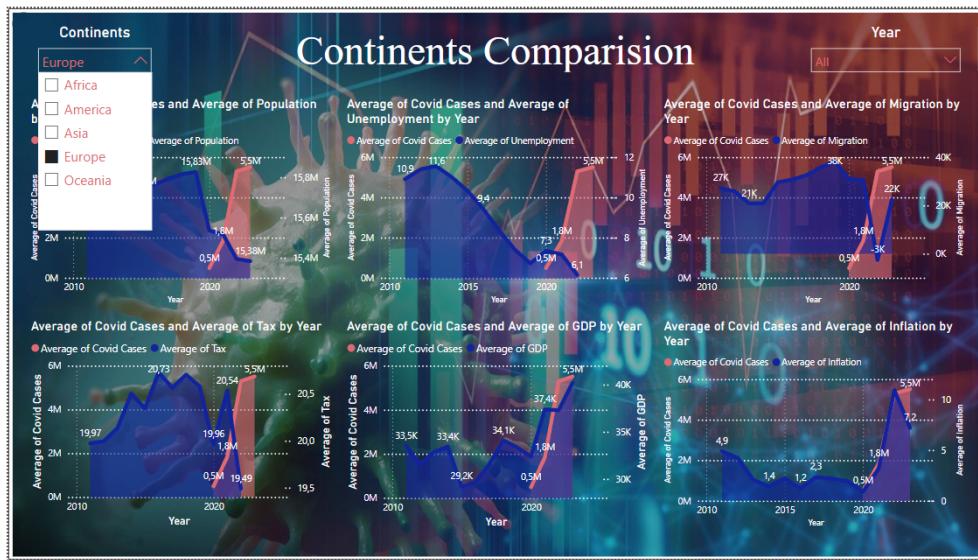
**Inflation** is a special case. As shown in the previous section, America, specifically Venezuela in 2018, exhibited values completely different from other countries and continents. Consequently, America is the only continent where there is no major difference in inflation during the COVID years compared to the pre-pandemic period. In contrast, the rest of the continents showed a substantial increase in inflation during the COVID years. For example, in Asia, the inflation rate rose from 3.88% in 2019 to 14.11% in just three years.

**Migration** shows two different kinds of impacts. In countries with values below zero, such as Africa and Asia, the numbers rose closer to zero, for example, from -25k in 2016 in Africa to only -4k. On the other hand, the continents that had positive values experienced a drop. For instance, in Europe, the values went from 38k before the pandemic to 30k in 2021.

In terms of **Population**, Europe and America were the most affected by the pandemic. In Europe, there had been a progressive increase in average values since 2010, but in 2020, the population dropped from 15.83 million to 15.53 million, continuing to decline until it reached 15.38 million in 2023. In America, despite improvements in the first two years of the pandemic, there was a significant drop in 2023, with the population decreasing from 26.9 million to 25.5 million in just one year.

The impact of COVID-19 on **Taxes** was global, with every continent experiencing an increase from 2019 to 2023. In Africa, the average values rose from 14.9% in 2018 to 22.96% in 2022. The only significant drop occurred in Europe, where the value fell to a new low of only 19.49% in 2022, compared to over 20% in the pre-pandemic period.

**Unemployment** around the world suffered due to the pandemic, with each continent showing a similar pattern. In the first year of the pandemic, there was a major increase in the unemployment rate. For example, in America, the rate was 7.7% in 2019, but it rose to 10% in just one year. However, in the following years, 2022 and 2023, the rates improved and dropped. In most countries, the unemployment rate in 2023 reached the lowest value recorded from 2010 to 2023. For instance, in Oceania, the pre-pandemic average was around 6%, but in 2023, it dropped to 5.49%.



**Figure 9** Dashboard Continents Variable Comparision

## 7 Discussion

The COVID-19 pandemic profoundly affected various economic parameters globally and across different regions and countries.

### 7.1 Employment Rates, Income Inequality, and Poverty Levels

The pandemic caused a significant spike in unemployment rates worldwide due to the global lockdowns and disruptions in economic activities. As highlighted in the results, unemployment rates increased sharply in 2020 across all regions but showed signs of recovery in the subsequent years. For instance, the global unemployment rate rose

from 7.22% in 2019 to 8.26% in 2020 but then gradually decreased to 7.2% by 2023, indicating resilience in the labor market.

Income inequality and poverty levels are intricately linked to unemployment and economic disruption. The increase in unemployment likely exacerbated income inequality and poverty levels, as lower-income groups were disproportionately affected by job losses and reduced economic opportunities. Additionally, changes in consumer behavior and spending patterns were observed, with a shift towards essential goods and services and a decline in non-essential spending.

## 7.2 Global Economic Growth and GDP Per Capita

The pandemic initially led to a decline in global GDP growth, but many regions experienced a strong rebound in the following years. For example, global GDP showed a notable increase from around \$12,000-\$14,000 per capita pre-pandemic to \$17,000 in 2023. This recovery can be attributed to the easing of lockdown measures, government stimulus packages, and the adaptation of businesses to new market conditions.

## 7.3 Comparison Between G8 and Non-G8 Countries

The economic impacts of COVID-19 on inflation, migration, population, GDP, taxes, and unemployment varied between G8 and non-G8 countries. In the G8 countries, GDP experienced a substantial drop during the first year of the pandemic but recovered, reaching a peak of \$45,000 in 2023. Inflation surged to unprecedented levels, peaking at 7.94% in 2022 before decreasing in 2023.

Migration patterns in G8 countries were disrupted, with significant fluctuations observed. The G8 countries experienced a sharp decline in migration numbers followed by a rebound. Population growth in G8 countries remained steady, showing resilience despite the pandemic's challenges.

In terms of taxes, G8 countries saw a dramatic drop in tax rates in 2022, reflecting the severe economic impact of the pandemic. Conversely, non-G8 countries, particularly the G20, experienced an increase in tax rates during the same period, indicating differing fiscal responses to the crisis.

## 7.4 Socio-Economic Impacts Across Continents

The pandemic's socio-economic impacts varied across different continents, highlighting both common trends and unique regional effects. Globally, GDP saw a significant decline in the first year of the pandemic but rebounded in subsequent years. For instance, Asia's GDP rose from \$12,000 in 2020 to nearly \$16,000 in 2023.

Inflation rates spiked on most continents during the pandemic. In Asia, the inflation rate rose from 3.88% in 2019 to 14.11% in 2023. Migration patterns also shifted, with continents like Africa and Asia experiencing reduced negative migration, while Europe saw a decrease in positive migration values.

Tax rates generally increased worldwide during the pandemic, except in Europe, which experienced a notable decrease. Unemployment rates initially surged across all continents but improved in the following years, reaching new lows by 2023. Population

trends varied, with Europe and America facing declines during the pandemic years, contrasting with other continents' steady or increasing populations.

## 8 Conclusion and Critical Analysis

In conclusion, the COVID-19 pandemic had a profound impact on global economic parameters, including GDP, inflation, migration, taxes, and unemployment. The pandemic's effects varied across different regions, with both G8 and non-G8 countries experiencing significant disruptions but showing resilience and recovery in subsequent years. The analysis highlights the diverse and far-reaching socio-economic changes brought about by the pandemic, underscoring the need for continued monitoring and adaptive economic policies to address ongoing challenges.

The pandemic underscored the importance of resilient economic policies and the need for adaptive strategies to mitigate such unprecedented shocks. It highlighted disparities in economic resilience and recovery rates between developed and developing nations, calling for more inclusive and supportive global economic frameworks.

Moreover, the pandemic's impact on income inequality and poverty levels requires further investigation, as the crisis likely exacerbated pre-existing socio-economic disparities. The shift in consumer behavior and spending patterns towards essential goods and services also provides valuable insights for future economic planning and crisis management.

Future research should focus on long-term socio-economic impacts, particularly in understanding how temporary measures implemented during the pandemic have shaped current economic policies and practices. Additionally, there is a need to explore the pandemic's effects on mental health, education, and overall well-being, which are integral to a comprehensive understanding of its socio-economic impact.

Overall, the COVID-19 pandemic brought extensive socio-economic changes, affecting multiple aspects of the global economy. Continued monitoring, research, and adaptive economic policies are essential to address the ongoing challenges and ensure sustainable recovery and growth in the post-pandemic world.

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