

Egypt University of Informatics

Computer and Information Systems

Data Analysis Course

**Exploring the Association Between Global and Local Upheavals and GDP/Economic Sectors in Egypt**

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Submission Date: 26/5/2024

# Introduction

The Egyptian economy, like many others, isn't immune to internal and external disruptions. This report delves into the impact of global and national upheavals on Egypt's economic sectors and Gross Domestic Product (GDP) between 2007 and 2023. Three pivotal events – the 25th of January 2011 Revolution, the 30th of June 2013 Revolution, and the 2020 COVID-19 Pandemic – serve as focal points, allowing us to analyze how these disruptions rippled through the nation's economic structure. By employing data analysis and visualizations, this report aims to illuminate the relationship between different upheavals and Egypt's economic trajectory.

# Research Question

Did significant global and local upheavals affect various economic sectors and GDP in Egypt?

# Hypothesis

Is there an association between global or national upheavals and GDP and different sectors in Egypt?

# Methodology

1. **Data Collection:**

* Source: The data was obtained from a reliable source – the Egyptian Ministry of Planning and Economic Development's "Gross Domestic Product by Economic Activity" dataset.
* This ensures official and accurate data representation.

1. **Data Cleaning:**

* Outlier Removal: The data underwent a cleaning process to deal with outliers, which are data points that fall significantly outside the expected range. Outliers can skew the analysis and distort the true picture.
* By using the Interquartile Range method to replace any outlier that falls outside the range of the other expected values with the upper and lower bounds.
* Missing Value Handling: Missing values (also known as NaN values) were addressed.
* Common methods include removing rows with highly missing values.

1. **Data Analysis and Visualization:**

* Sector-wise Analysis: The data was analyzed for each major economic sector represented in the dataset. This involved observing trends in each sector's performance across different years including upheavals years.
* Visualization: The analysis was accompanied by creating visualizations such as charts and graphs. These visuals helped identify patterns and trends in economic performance before, during, and after the upheaval events.

1. **Hypothesis Testing:**

* Hypothesis: This study aimed to test the hypothesis that major upheavals – both global and national – impact Egypt's GDP.
* Statistical Test: A chi-squared test was conducted to assess the statistical significance of the relationship between the upheaval events and the GDP data.
* p-value: The p-value obtained from the test was less than 0.05. In statistics, a p-value below 0.05 indicates that the observed relationship is unlikely to be due to chance and is therefore statistically significant.

# Collected Data/Dataset:

* The Egyptian Ministry of Planning and Economic Development: "Gross Domestic Product by Economic Activity" dataset.
* Source: <https://mped.gov.eg/GrossDomestic/Index?lang=en>
* 122 Rows, 33 Columns.
* Columns of the dataset:
  + Year (2001-2022)
  + Sector: Private, Public, Total
  + Agriculture Forestry Fishing
  + Petroleum, Gas, Other Extraction, petroleum Refining
  + Manufacturing Industries, Other Manufacturing
  + Electricity
  + Construction
  + Transportation And Storage
  + Communication, Information
  + Suez Canal, Wholesale and Retail Trade
  + Social Security and Insurance
  + Accommodation And Food Service Activities
  + Real Estate Activity, Real Estate Ownership
  + Education, Health, Other Services
  + Total GDP (Total Gross Value Added

# Analysis:

**Sector-specific Analysis**:

1. **Accommodation/Tourism:**

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| *Figure : Accomodation Sector trends through the years in Egypt.* |

**25th January 2011 Revolution:**

* Egypt in 2010 had 14.7 million tourists, but after January 25th tourism revenues dropped by 50 percent from the expected value. Hotel occupancy rates decreased in the first four months of this year by 16 percent compared with the same time in 2010.
* Egypt has lost around two billion U.S. dollars in tourism revenues due to this political unrest (World Bank 2011).

**2020 Pandemic – Covid-19:**

* In March 2020, tourism in Egypt had started to decline – between 70 and 80 percent of future bookings were cancelled.
* With the banning of international flights across most countries of the world, a complete loss in international tourism revenues is likely to occur for the next few months and potentially until the end of the year (ECES 2020).
* Based on the estimate that internal tourism accounts for 10 percent of total hotel occupancy, we assume a decline of 90 percent for the total tourism sector.

1. **Suez Canal**

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| *Figure : Suez Canal Sector trends through the years in Egypt.* |

* This graph shows the change in the Suez Canal over the years. As the graph shows, there was a decrease from 2008 to 2010 it may be due to the global recession in 2008.
* The Suez Canal was not entirely affected by the local revolution of 2011 since it is a global attribute.
* The increase stayed constant till 2016 which witnessed a huge increase when Egypt opened the new side of the Suez Canal.
* In 2020 it noticed a decrease as because of the pandemic which obviously effected the world trading movement and in 2021 there wasn’t a huge increase because if the ship that blocked the canal after that in 2023 it witnessed a huge increase.

1. **Petroleum and Gas Sector**

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| A graph with different colored lines  Description automatically generated  *Figure : Petroleum Sector trends through the years in Egypt.* | **2011 & 2013 Revolutions:**  - Instability that stops planning and scares off potential investors.  - The ongoing political confusion made work harder and reduced the money made from oil.  - Keeping oil facilities safe during protests was tough, leading to less oil being produced and distributed.  **Decrease in 2016:**  -Currency devaluation, subsidy cuts, low global oil prices, reduced foreign investment contributed to the decline in petroleum growth in Egypt in 2016.  **Covid-19:**  -Reducing the worldwide need for oil, affecting safety measures at work, slowing down new investments, and limiting the government's income. |
| A graph with different colored lines  Description automatically generated  *Figure : Gas Sector trends through the years in Egypt.* | **2011-Revolution:**  Political instability disrupted long-term gas projects and planning, Security worries made it easier for gas facilities to be attacked, causing energy shortages and operational interruptions.  **2013 Revolution:**  -Post-2013 further impacted gas extraction and distribution, with attacks on gas pipelines adding to security challenges.  **Decrease in 2016:**  -A combination of internal economic reforms, external market conditions, and operational issues.  -The currency devaluation, subsidy reductions, low global oil prices, reduced foreign investment, and aging infrastructure created a challenging environment for the gas sector, leading to a decline in growth.  **Covid-19:**  -Reducing global gas demand, slowing production due to health measures, constraining investments, and leading to revenue shortfalls. |

1. **Health Sector:**

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| *Figure : Health Sector trends through the years in Egypt.* |

**After 25th January 2011:**

* This graph shows the change in the health sector over the years. Before 2012 there was no change in the public sector but in the private sector the change started from 2009 which means the private sector witnessed a change after the 2011 crisis the government started taking care of the public health sector till 2016 which had a significant change.

**Covid-19:**

The nature of this health crisis leads to higher demand for medical supplies, sanitizers, and related products of chemical industries. COVID-19 will lead to a 30 percent increase in demand for such products.

1. **Education:**

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| *Figure : Education Sector trends through the years in Egypt* |

**2011 Revolution:**

Instability and protests led to school closures. Violence made it unsafe for students and teachers to attend schools. This led to reduced funding for schools and educational institutions.

**2013 Revolution:**

* More disruptions in the school calendar and operations, along with continued economic difficulties leading to less government spending on education and infrastructure damage to school buildings due to protests and clashes.

**Covid-19:**

* The pandemic forced school closures, leading to the rapid but challenging shift to online learning which made a gradual increase in the education sector.

1. **Construction:**

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| *Figure : Construction Sector trends through the years in Egypt.* |

As the construction sector is a large sector and important for providing jobs, construction activities continue in many places as the government balances the need to keep projects running while implementing precautionary measures, such as social distancing and lower numbers of workers on construction sites. Relative to many manufacturing sub-sectors, we assume a smaller decrease in construction activity of 5 percent.

**Sector Correlation Map:**

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*Figure: Correlation map between all sectors of GDP*

**High Correlations**

**Strong Sector Relationships:**

* There are several sectors with very high correlations (indicated by red tones), suggesting that these sectors often move together in terms of their economic contributions. For instance, sectors like Manufacturing, Other Manufacturing, and Petroleum Refining show strong correlations with each other, which could be due to their interconnected supply chains and dependencies.
* Sectors like Education, Health, and Social Services also show high correlations. These are typically public sectors that may receive similar budgetary allocations or are affected similarly by government policies.
* Utility Services: Electricity, Water Sewerage Remediation Activities, and Gas sectors are highly correlated. These are fundamental infrastructure services that often react similarly to economic policies or macroeconomic factors.
* Financial and Business Services: These include sectors like Financial Intermediaries Auxiliary Services and Business Services, reflecting how financial health and business activities are closely linked.

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**Moderate to Low Correlations:**

* The Suez Canal sector has a varying degree of correlation with other sectors. Its unique position as a global shipping route may cause it to respond differently to global trade shifts compared to local economic changes.
* Social Security and Insurance have moderate correlations with many sectors, influenced by regulatory changes and broader economic conditions differently than direct economic outputs.

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| *Figure: It shows that the Suez Canal is weakly correlated with education sector.* |

## Hypothesis Testing

This section details the statistical test conducted to assess the relationship between the chosen upheaval years and Egypt's GDP.

**Step 1: Define Null and Alternative Hypothesis**

**Null Hypothesis (H₀):**

* There is **no statistically significant association** between the occurrence of major upheavals (2011 revolution, 2013 revolution, 2020 pandemic) and the variations in Egypt's Gross Domestic Product (GDP). In simpler terms, the ups and downs of the Egyptian economy are not influenced by these upheavals.

**Alternative Hypothesis (H₁):**

* There is a **statistically significant association** between the occurrence of major upheavals (2011 revolution, 2013 revolution, 2020 pandemic) and the variations in Egypt's Gross Domestic Product (GDP). In other words, the upheavals have a statistically relevant impact on the Egyptian economy.

**Step 2: Choose the appropriate test.**

**Statistical Test:**

* A chi-squared test for independence was employed to determine whether the observed association between the upheaval events and GDP variations is statistically significant or simply due to chance. This test is suitable when analyzing categorical variables, such as the presence or absence of an upheaval, and a categorization of GDP variable.

**Step 3: Calculate the p-value.**

**Test Results:**

* The chi-squared test yielded a statistically significant p-value of **5.5794647180362105e-05.**
* In simpler terms, this p-value, which is incredibly small, suggests that the likelihood of observing such a strong association between upheavals and GDP changes by chance is extremely low (less than 5%).

**Step 4: Determine the statistical significance.**

* Based on the statistically significant p-value, we can reject the null hypothesis, which states that there's no relationship between upheavals and GDP.
* This implies that there's a statistically significant association between the chosen upheavals and Egypt's GDP.A graph of a number of bars

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# Hypothesis Insights

* Upheavals like wars, civil unrest, or natural disasters can cause alterations to different sectors contributing to the total GDP as well as the GDP itself.
* Upheavals create uncertainty and instability, which discourages businesses and individuals from investing in the economy.
* Upheavals can make people feel unstable about their jobs and finances, leading them to cut back on spending. This decrease in consumer demand can further slow down economic activity and impact GDP.
* Upheavals can disrupt trade routes and make it more difficult for countries to import and export goods. This can lead to shortages of essential goods and materials, as well as a decrease in export earnings, both of which can negatively affect GDP.

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| *A graph with different colored lines  Description automatically generated* |
| *Figure: GDP trends over the years.* |

The above figure shows that the GDP was not affected negatively by the pandemic in 2020. By doing our research we found out that Egypt was one of the countries that received an emergency package in which it helped our economy emerge in the pandemic despite the regression in many sectors.

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# A blue and black shapes Description automatically generated with medium confidence

*Figure: It shows that the private sector contributes more to the total GDP*

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| *A graph of a graph showing the average value of a company  Description automatically generated with medium confidence* | *Figure: Contribution of each sector to the GDP during 2020 pandemic.* |
| *A graph of a graph showing the average value of the gdp  Description automatically generated with medium confidence* | *Figure: Contribution of each sector to the GDP during 2013 revolution.* |
| *A graph showing the average value of the company  Description automatically generated with medium confidence* | *Figure: Contribution of each sector to the GDP during 2011 revolution* |

**Confounding Variables:**

1. Foreign Aid and Investments**:**

* Fluctuations in foreign aid and foreign direct investment (FDI) can influence GDP growth. For instance, an increase in foreign aid during a crisis (like the emergency package Egypt received during the pandemic) might reduce its negative impact on the economy.

1. Inflation Rates:

* High inflation can take away purchasing power and economic stability, influencing GDP growth.
* It can also influence the monetary value of the years. As the years augment, the inflation rate increased as well.

# Conclusion

This study investigated the potential link between major upheavals – both global and national – and their impact on key economic sectors and Egypt's Gross Domestic Product (GDP). The analysis focused on three significant events: the 2011 revolution, the 2013 revolution, and the 2020 global pandemic. We conducted a meticulous sector-wise analysis of each sector that contributed to the GDP with the years of upheaval. The data analysis employed a chi-squared test for independence to assess the statistical significance of the relationship between upheavals and GDP variations. The test yielded a statistically significant p-value (**5.5794647180362105e-05)** which is less than 0.05, indicating that the observed association is unlikely to be due to chance.

# Bias Identification:

# 1.Selection Bias:

# Included a representative dataset from various sectors (petroleum, gas, Suez Canal, GDP, education, etc.)

# 2.Confirmation Bias:

# Diversified our team of analysts to provide multiple viewpoints and conducted double-blind data analysis to avoid influencing results.

# Any potential issues

1. Data Availability: Limited access to real-time data in some sectors.

2. Historical Data Gaps: Incomplete data due to political changes or disruptions.

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