Dean&Francis
ISSN 2959-6130

A comparative study on oil price volatility and social instability: Evidence from 1970-2014

Lufan Chen[1],

Zhibin Li[2],

Qiheng Wang[3],

Yixi Wang*[4]

[1]Ji'nan University-University of Birmingham Joint Institute, Jinan University, Guangzhou, 511443, China, lxc621@student.bham.ac.uk,
[2]Political Science Department, University of California, Davis, Davis, 95616, USA, hjkli@ucdavis.edu,
[3]Economic department, LingNan university, HK, 999077, HK, China 3048467860@qq.com,
[4]Ji'nan University-University of Birmingham Joint Institute, Jinan University, Guangzhou, 511443, China, yxw1176@student.bham.ac.uk

*Corresponding author email: yxw1176@student.bham.ac.uk
All the authors contributed equally to this work and should be considered as co-first author.

Abstract:

In this research, we studied how oil prices volatility led to economic instability and then result in societal instability. To be specific, we explored a chain reaction where the inflation volatility, indicating economic instability, is the mediator and the civil unrest, indicating social instability, is the final result. Most of our research's data are from the world bank (Gini, GDP per capita, oil price and inflation), civil unrest comes from the Urban Social Disorder 3.0 by Thomson et.al (2022). Based on those data we found not all countries' number of civil unrest would be affected by the change of oil price. Only for those high-income countries which have imported a lot of oil there is a significant influence of oil price change on the number of civil unrests. 1% increase of the oil price will lead to 0.00614 more civil unrest among high-income import countries. We hope this chain reaction will be noticed in countries that could be affected and gives people multidimensional understanding about oil price volatility.

Keywords: oil price volatility; inflation social instability; civil unrest

ISSN 2959-6130

1. Introduction

Crude oil is a commodity worldwide and its price is affected by many factors. For example, as shown in Figure 1, demand for oil plunged in 2020 during the COVID-19 pandemic when lockdowns led the price to fall below zero for the first time in history due to a major downturn in economic activity. Another obvious increase in crude oil prices in 2022 is mainly because of the Russia-Ukraine War which has higher demand and low supply of oil. Also, many other things affecting the balance between demand and supply of oil will then lead to changes in oil prices. We can clearly tell from the graph that the prices of oil are ever-changing and the change is unpredictable. Meanwhile, oil price is an important variable in the global economy with a wide-ranging impact encompassing economic, political, and social aspects. Such as GDP (Jiménez-Rodríguez and Sánchez, 2006) and inflation (Sek et al. 2015). These problems will then lead to some social instabilities like political unrest (Vadlamannati and de Soysa, 2020) and crime(Andrews and Deza, 2018), which is close to our lives. So this correlation is worthy of studying and our topic is exactly how oil price volatility affects social factors.

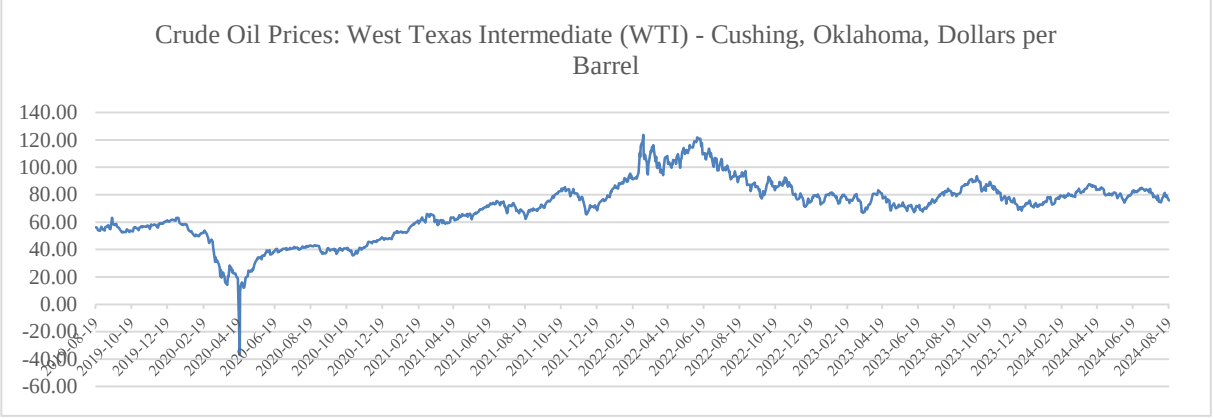

Figure 1: Crude Oil Prices: West Texas Intermediate(WTI)

Although previous research has focused on the impact of oil prices on economic instability and social instability respectively, they have ignored the fact of social instability caused by economic instability. Based on previous papers, our research focuses on and analyzes this chain reaction. The most relevant article to ours is Vadlamannati and de Soysa (2020), which talks about the relationship between oil prices and social conflicts. In our paper, we add a median factor to further explain the relationship. Our topic focused on how oil price volatility leads to economic instability and then leads to social instability. To be specific, oil price volatility has an impact on economic instability (here we use inflation to represent economic instability). Inflation will affect some mechanisms such as income inequality, social unemployment, or the living standard. They play a role as media to influence our target research object— social instability (here we choose civil unrest to represent it). We expect to run regressions to find the relationship between the oil price and social instability in the grouping countries with inflation as a media factor.

Our study utilized country-year data on oil price, oil price volatility, inflation volatility (CPI), unemployment rate, income inequality level, civil unrest frequency, the Gini index, and GDP per capita. Oil price, of course, is the independent variable we study. Inflation volatility (CPI), the first dependent variable, is an independent variable in the next chain with the unemployment rate and income inequality level as the dependent variables, which then lead to civil unrest—the final dependent variable. Meanwhile, we take GDP per capita and the Gini index as control variables. Although we have data covering 1960 to 2014, we discarded that in 1960-1969 because there were almost no changes in oil prices in this period. We only focused on the years from 1970 to 2014, where the data is more relevant. We will explain in detail later in the Data section why we selected and discarded those time periods of data. Additionally, we did not study all countries around the world, instead, we made seven groups of countries based on whether they import or export oil, their income levels, their level of dependency on oil, and their overall social stability.

In our paper, we found that by using inflation as an intermediate among those high-income importing countries oil price change has a significant influence on the number of civil unrest happening in those countries. A 1% increase in the oil price could lead to 0.00614 more civil unrest happening in those high-income oil-importing countries. While for the other groups, the influence is not significant,

it implies that high-income importing countries should pay more attention to the oil price change if they want to maintain the stability of society.

The significance of our research is that we heterogeneously studied the various impacts of changes in oil prices in different countries, seeing economic factors as a mediator to lead to social instabilities, which enriches research on oil prices and can give people a more comprehensive and clear understanding of oil prices. Also, we have grouped countries in detail on multiple dimensions to make the results more targeted and correct for a certain research object, providing new ideas for country grouping in such studies.

The outline of our paper is as follows. Section 2 describes the literature review, Section 3 shows the data we use in this article in detail, Section 4 is about the methodology, Section 5 gives a discussion about this topic and the last section shows our conclusion.

2. Literature review and hypothesis:

Oil is the most essential energy source and a crucial commodity influencing the global economy. The change in oil prices will affect consumers' purchasing power, the prices of end products and transportation industry costs, which further create a chain reaction that affects the prices of other goods and services, thereby impacting inflation. Previous studies conducted by Siok Kun Sek (2015), Choi et al. (2018), and Salah A (2019) concluded that oil prices have an asymmetric impact on inflation, with an increase in oil prices having a significant positive effect on inflation, while a decrease in oil prices has a relatively insignificant impact on inflation. Specifically, the implications and pathways of these effects vary for different types of countries and will be further elaborated in the detailed group discussions in this article.

We have noticed that inflation has a complex and multifaceted impact on the unemployment rate. This influence is caused by a combination of factors, such as the country's economic background, policies, etc. (Friedman,1977). However, generally speaking, economists still believe that there is a direct negative correlation between inflation and the unemployment rate. Moderate inflation can stimulate production and drive economic growth by stimulating consumption, thereby promoting employment. As proposed in the following two articles, Swastika et al. (2016) and Waud (1970). The reason previous literature has drawn different conclusions about the impact of inflation on the unemployment rate is that these studies selected different research subjects. Instead, we will further study the relationship between inflation and unemployment with a more detailed grouping.

We study the relationship between Unemployment and social unrest. Unemployment can lead to reduction of people's income, a decrease in purchasing power, and an increase in the social Gini index. This leads to an increase in negative emotions, a decrease in political identity, dissatisfaction, and resentment towards society, and causes social unrest. Moubarak (2014), and Sween and Clignet (2014) also proposed the conclusion that an increase in the unemployment rate will lead to a rise in social unrest. Therefore, it is pronounced that the unemployment rate will affect social unrest, which is also the last link of the first logical idea in this article.

Meanwhile, inflation also has an impact on income inequality. This impact is multidimensional and variable, involving multiple levels of economy, society, and politics. Exploring this impact requires a more detailed classification study of different types of countries. Previous research results have also yielded different outcomes due to variations in research methods and subjects. By research in 24 developed countries and 66 developing countries, Siami-Namin and Hudson (2019) proposed that as inflation rises income inequality will decrease. Income inequality then reaches a minimum and then starts growing again. In other research, Jin (2009) proposed that Inequality shrinks with the rise of inflation when capital heterogeneity dominates and enlarges when skill heterogeneity dominates. In general, most studies (Law, 2020; Albanesi, 2007) suggest a positive correlation between inflation and social inequality.

Income inequality has a specific impact on social unrest. Income inequality may lead to social discontent among people, exacerbate class conflicts and tensions, and increase illegal and criminal behavior. Wilkinson and Pickett (2009) put forward that societies with higher income inequality tend to have more social problems, such as mental illness, violence, and poor educational outcomes. Alesina and Perotti (1996) also find a positive relationship between income inequality and civil unrest.

The research we referred to above has only studied singular causal links between different variables. For example, it considered solely the impact of oil prices on inflation, the effects of inflation on unemployment rates, or the impact of unemployment rates on social unrest. However, these relationships were not connected in a more complex logical chain in previous research. Based on the research mentioned earlier, we want to incorporate different variables to form more complex logical links. We have found that oil prices are linked to inflation, which affects income inequality and unemployment, both contributing to social unrest. This means that oil prices can be connected to social unrest through three intermediate variables: inflation, unemployment rate, and income inequality. Under

ISSN 2959-6130

this logical framework, our research studies the impact of changes in oil prices on inflation, then links inflation to unemployment and income inequality, and finally concludes with the effect of oil prices on social unrest.

As mentioned, previous studies on the impact of inflation on unemployment and income inequality have yielded some different results. We consider that the impact of inflation on income inequality and unemployment rates is complex and multidimensional, and different countries' economic conditions can also lead to varying degrees of this impact. Therefore, we believe that the different research objects in earlier literature and the limited grouping of research objects in previous literature have led to different research results. In our research, we aim to attempt a more comprehensive grouping to see if different conclusions can be drawn. We divided countries into seven groups based on three criteria: Income level, level of dependency on oil, and import or export of oil. The seven groups are import countries, export countries, high oil dependency countries, low oil dependency index countries, low-income and relied-on oil importing countries, low-income import countries, and high-income import countries. This grouping carefully considers the differences in economic conditions and the varying effects of oil prices on different countries, which have significant research value.

Through the above literature review, we found that inflation and unemployment rates exhibit collinearity, as seen in the Phillips curve. Therefore, inflation and unemployment rates are not suitable to exist as independent variables (x) simultaneously. So, we decided to give up studying unemployment and focus on income and income inequality. We will use the index Gini and GDP PCI to represent the degree of income inequality.

According to the references we mentioned earlier and the logical chain we constructed, we found that although the relationship between oil prices and inflation, as well as the relationship between income inequality and social unrest, are relatively straightforward, the impact of inflation on income inequality is more complex. The effect of inflation on income inequality is uncertain and complex to measure. In different countries, the influence of inflation on income inequality varies, making it challenging to study this effect individually. Therefore, we will make assumptions based on a simple logical chain. We propose the following three hypotheses:

Hypothesis 1. For oil-importing countries, oil price volatility has a positive impact on social unrest.

Hypothesis 2. For oil-exporting countries, oil price volatility has a negative impact on social unrest.

Hypothesis 3. High-income countries are more susceptible to oil price changes, triggering more civil unrest.

3. Data and Variables

Dependent variable, independent variable, mechanism variable: We use oil price volatility, inflation volatility, and civil unrest as our main variables, and we use Gini and GDP per capita as control variables. We want to study the relationship between oil prices and Civil Unrest, we use Inflation as a median variable. We include Inflation volatility for mediation analysis because we find inflation as a better median to study the relationship between Oil price changes and Civil unrest.

The Control variables of GDP PCI and Gini coefficient are good measurements for income and income inequality. They incorporated these factors because we want to exclude the effect of economic factors other than oil price and inflation that might contribute to civil unrest. As described in literature reviews, we found that income inequality and social unrest have multifaceted and interconnected relations.

Our study utilizes a panel dataset encompassing country-year data on oil prices, inflation, civil unrest, Gini index, and per capita GDP. The oil price data, spanning from 1960 to 2023, is an average of the WTI, Brent, and Dubai oil prices. This oil price indicator is sourced from the World Bank.

Inflation is measured using the Consumer Price Index (CPI) from 1960 to 2023, chosen from the World Bank. Our independent variable is oil price volatility. We use the Consumer Price Index (CPI) for inflation measurement. While some might consider using PPP, the GDP deflator, or other indicators, we chose CPI because it primarily measures the cost of living and consumer goods, which are closely related to living expenses. Since our ultimate goal is to analyze the impact of social events, the cost of living likely has a more significant influence, making CPI the most appropriate choice.

Civil unrest data is from the Urban Social Disorder 3.0 by Thomson et.al (2022), provided as a country-year panel dataset covering 186 national capitals and major urban centers from 1960 to 2014. The data provides 12 types of nonviolent and violent events, offering detailed numbers on the participants, their targets, the timing of each event, and the scale of involvement, including the number of participants and fatalities.

The study also includes two control variables related to income and income inequality - the Gini index and GDP per capita. Based on our literature review, we found that income inequality played a crucial role in influencing our research. We therefore choose the Gini index as our controlled variable, sourced from the World Bank, which measures income inequality within a country and accounts for varying income distribution across different population

groups, which is a perfect indicator for us to study income inequality. Besides Income inequality, we also include GDP per capita as another control variable. It represents the monetary value of final goods and services produced in a country within a given time period. This indicator is vital for distinguishing between different stages of economic development across countries, which is another economic factor that we want to include in our study. Overall, both control variables help contextualize the relationship between the main variables and the socio-economic conditions under study.

3.1 Data Processing

We reorganized the collected data in Excel to form Panel data. Most of the variables are easy to source, such as inflation volatility (CPI), Gini coefficient, and GDP Per Capita. For oil price volatility, we used the annual average price of Dubai, Brent, and WTI oil prices to calculate the yearly oil price change in percentage, and formed a similar panel data. We picked out the 36 countries' names with their corresponding oil price for each year between 1960 and 2023. Similarly, we reorganized the data of GDP PCI, Gini coefficient, and inflation volatility with the same countries' groups and time frame.

However, grouping the data for civil Unrest is more complicated. In total, we classified 7 groups based on the magnitude, the events type, and a combination of both those two factors. We believe that both event types and event magnitudes have significant meanings, as we want to know which types and the scales of social events have a stronger relation with the changes in oil pieces, or inflation. In other words, there are some civil unrests that is more related to, or even caused by oil price changes, whereas others might have little to do with it. The following paragraphs will be our detailed data-sourcing methods.

The data downland from Urban Social Disorder 3.0 includes multifaceted information including country, city, beginning year, end year, events types, participants, magnitude, etc. We first selected the 36 countries we used and counted the event numbers for every year between 1960 and 2014 based on the beginning year (BYEAR).

For problem type, we then classify our data into violent and nonviolent data based on the problem type (PTYPE) provided in Urban Social Disorder 3.0. The PTYPE is nominal data (used to label categories) that classify different types of conflict events, ranging from serious conflicts like wars and violent riots to peaceful protests, with a sense of ranking where more severe conflicts get lower numbers (like warfare at 10) and less severe, peaceful actions get higher numbers (like peaceful protests at 62). For research, we define violent events with a nominal value between 10 and 51, and nonviolent events between 60 and 62. We excluded number 70 because this problem type has a vague definition.

Besides grouping problem types, the number of participants is another important factor we studied. Urban Social Disorder 3.0 has a nominal value from 1 to 13, and 99, indicating the different scales of participants in each event. (For example, 1 stand for a numerical value of less than 10; 2 means the number of participants is between 10 and 100; and 7, which represents that the number of participants is over 1 million, and numbers above 7 are either unknown or hard to predict). We classified the scale of participants into 2 groups, the first group is classified as nominal value 1-3, which indicates a number of participants between 1 and 1000; the second group has a much larger number of participants: from 1,001 to over 1,000,000, which stands for the nominal value of 4-7.

In conclusion, for civil unrest, we classified 7 groups of data and counted the number of events occurrences by each country and year. We then concluded the group names as "All", "Violent", and "Non-Violent" measuring event types. We also have "Scale 1-3" and "Scale 4-7" indicating whether participants have small groups or large groups. We then combine the effects of event types and scales to form "Violent 4-7" and "Non-violent 4-7" to distinguish the large-scale violent and non-violent events, believing that the large-scale events might have a stronger relationship with the changes in oil price, and also because that large-scale events have stronger impacts on society.

At last, we incorporated all the data for 36 countries from 1960 to 2014 into an Excel, containing information on oil price volatility, inflation volatility, GDP PCI, Gini coefficient, and civil unrest for each year by each country.

Table 1. Descriptive Statistics

	Observation	Min	Max	Mean	Median	90% Percentile
Oil Price ($)	1540.0	1.7	105.0	34.4	23.6	96.2
Oil Price Volatility (%)	1540.0	-47.2	290.9	17.2	7.9	41.5
Inflation Volatility (%)	1362.0	-9.8	2947.7	18.7	4.8	20.6

ISSN 2959-6130

Civil Unrest (No.)	1540.0	0.0	34.0	2.2	1.0	6.0
GDP PCI ($)	1476.0	63.3	103553.8	11496.2	4712.4	34515.4
Gini Index	490.0	23.0	63.3	37.4	35.0	51.0

3.2 . Descriptive Statistics

We focused on oil price volatility instead of raw oil prices because the latter showed no significant skew and lacked meaningful insights due to differing base values. The volatility data, however, revealed a large spread, with a maximum value of 290.92%. The difference between the mean (17.23%) and the 90th percentile (41.5%) indicates significant variability, with some extreme cases driving the wide range. This suggests that while most values are moderate, there are numerous outliers, reflecting the unpredictable nature of oil price fluctuations. Inflation volatility has a maximum value of 2947.73%, which is approximately hundreds of times compared to the mean (18.67%) and the 90th percentile (20.63%), indicating that there are a few extreme outliers in the data. However, Inflation Volatility is overall more concentrated than oil price volatility, since the mean (18.67%) and the 90th percentile (20.63%) are very close, demonstrating that most data points are grouped together. This tighter distribution suggests that inflation's impact is relatively consistent across different contexts, making it a more stable factor to consider when studying its effects on civil unrest. Civil unrest is generally low, with a median of 1 event, indicating that most countries experience very few incidents. The mean is slightly higher at 2.24, and the 90th percentile is 6, showing that even in more affected countries, unrest is still relatively uncommon. However, the maximum number of incidents is 34, highlighting that a small number of countries face much higher levels of unrest. This uneven distribution underscores the importance of examining the factors that lead to such disparities in civil unrest.

Controls: GDP PCI and Gini coefficient: The control variables, GDP per capita (PCI), and the Gini coefficient provide essential context for understanding the main variables. GDP PCI data is highly diverse, reflecting the nature of unequal economic development between low and high-income countries. This diversity emphasizes that no significant patterns are reviewed in the pattern of GDP PCI, but we still need to consider the economic differences in our analysis. Besides, the Gini index remains valuable for assessing income inequality's role in civil unrest. The Gini coefficient, although with much fewer observations (490 out of 1530), shows a more balanced distribution in its numerical values and is less likely to exhibit extreme variations.

4. Methodology

4.1 Grouping

Times: In our research, we divided the data into 4 specific periods (From 1970 to 2014, 1970 to 1980, 1980 to 2000, and 2000 to 2014) to better understand how oil prices affect civil unrest in different situations. One Data limitation that needs noticing is that although most of our data sources include the years between 1960 and 2023, the civil unrest dataset from Urban Social Disorder 3.0 only contains information till 2014. We had to shorten our entire time range to 1960-2014, as civil unrest is one of our main variables. Furthermore, we chose not to include the years from 1960 to 1970 because oil prices didn't change much during that time. Instead, we focused on the years from 1970 to 2014, when the relationship between oil prices and inflation was stronger.

The period from 1970 to 1980 is especially important because it suffered from a rapid global change where Middle Eastern countries reduced oil production sharply, leading to high inflation and various economic and social problems. Therefore, this period is excellent for us to study the effect of one of our main Independent variables – oil price volatility, and also provides valuable examples of how changes in oil prices can lead to unrest.

From 1980 to 2000, oil prices fluctuated relatively in a small range, but major global political and social changes became more prevalent, such as the fall of the Soviet Union and drastic changes in Eastern Europe, which led to increasing incidents of unrest. In other words, our dependent variables suffer from greater fluctuation while our independent variables are insusceptible to changes. This period has special research significance to explore how stable oil prices interact with increased political instability.

Our final period, from 2000 to 2014, was marked by a significant decrease in large-scale international conflicts, which means that fewer conflicts were causing social instability. Instead, oil prices are more directly linked to civil unrest. The specific time frame allows us to see how changes in our independent variables - oil prices - directly influence our dependent variables - social unrest since oil prices became more influential to social unrest during these years.

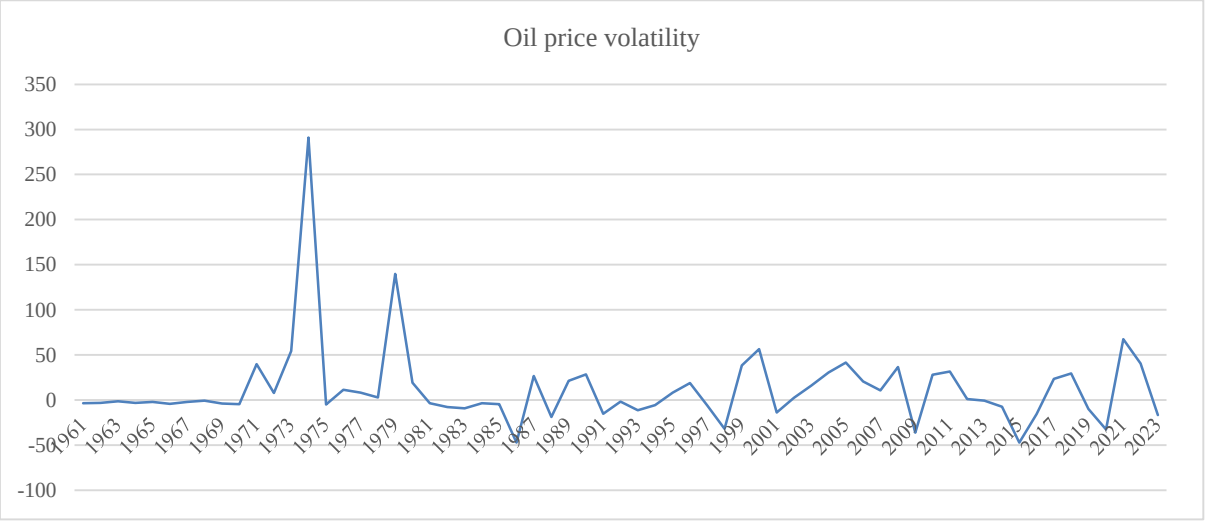

Figure 2. Oil Price Volatility from 1960-2023

Countries: To make our analysis clearer, we grouped the countries into seven categories with a total number of 36, based on whether they import or export oil, their income levels, their level of dependency on oil, and their overall social stability. These groups include oil-exporting countries, such as Canada, Saudi Arabia, Kuwait, Mexico, Norway, Russia, and Venezuela, and also oil-importing countries, including China, France, Germany, India, Italy, Japan, Korea, the UK, and the US. We extracted the classification from Wang et.al (2013), who aimed to study the influence of oil prices on the stock market.

Sek et.al (2015) studied the effect of oil prices on inflation and found an inversed outcome between high and low-oil-dependent countries. We therefore use the two groups they provided to do further study related to inflation and civil unrest. In Sek's study, the low-dependency countries are Norway, Denmark, United Kingdom, Canada, Mexico, Malaysia, Brazil, Venezuela, Ecuador, and Bulgaria, whereas the high oil-dependency countries are Singapore, South Korea, Philippines, Greece, Belgium, Italy, Pakistan, India, Portugal, Spain.

We also grouped our countries combining income level and trade type, forming low-income importers, including Ethiopia, Gambia, Mali, Mozambique, Senegal, Tanzania, and Uganda, along with high-income importers: France, Germany, Italy, Japan, Korea, the UK, and the US. Our method of grouping partially came from Akinsola and Odhiambo (2020), who listed out the low-income countries with high oil dependency and studied their economic behaviors in both the long run and short run. However, for High-income importers, we didn't find a matched group from previous studies. Instead, we use the World Bank's definition of high-income countries, with income per capita above US$14,005. We then selected a few high-income countries with large oil import amounts to create our new group.

In conclusion, grouping time periods allows us to see how oil price changes impact civil unrest differently across various economic and social settings, where our dependent and independent variables show distinctive features in each of the periods. Moreover, separating countries allows us to decode the complex effect of oil prices on inflation and civil unrest, distinguishing outcomes for different groups, which might be useful for specific policy implications based on the features of different nations.

4.2 : Result interpretation

For our research, we conduct an empirical experiment using a panel dataset to study the relationship between oil price volatility and the number of civil unrests. There are not many papers indicating these two have a direct relationship. However, research conducted by Thoresen (1982) and Choi et.al (2018) shows a positive relationship between an oil price change and inflation overall in countries. Other researchers like LeBlanc et.al (2004) and Salah (2019) focus on certain groups of countries and find the same relationship. Meanwhile, inflation has been proven to influence other factors like unemployment, income inequality, etc. (Friedman,1977) which will eventually lead to social unrest according to the research conducted by Moubarak (2014), and Sween and Clignet (2014). We decide to use inflation as an intermediate variable to study the relationship between oil price change and civil unrest. The research is divided into two parts, first part we look into the relationship between oil price and inflation (1), second step we look into the relation between inflation and the number of civil unrests (2).

ISSN 2959-6130

$Inflation_{i,t}=\beta_1 oilpricevolatility_{i,t}+\beta_2 GINI_{i,t}+\beta_3 GDPpercapita_{i,t}+\alpha+\varepsilon$ (1)

Number of civil $unrests_{i,t}=\gamma 1\ inflation_{i,t}+\gamma_2 GINI_{i,t}+\gamma_3 GDPpercapita_{i,t}+\alpha+\varepsilon$ (2)

α is the intercept, ε is a random interference item.

Step 1:

To study how inflation and oil price change are related for different groups of countries we get Table 2. Oil price volatility means the change of average oil price compared to the previous year by percentage, inflation indicates the CPI (consumer price index), and xxx means for a certain period the sample size is less than 10 due to the missing data.

For the whole time period exporting and importing countries' inflation has a positive relation with oil price change which fits the conclusion of Thoresen (1982), the result holds with the control variables. Without the control variables for these groups around a 10% increase in oil price will lead to a 0.4% increase in inflation, the result is very similar to the research of Choi et.al (2018). However, among these importing countries only high-income countries' inflation is influenced. The cause could be we choose CPI to indicate inflation, for those poor countries food and other necessities take a large component of CPI making inflation not sensitive to the change in oil price. Adding control variables makes the influence of oil price change on inflation weaker, a 10% increase in oil price will lead to a 0.2% increase in inflation.

During 1971-1980, besides high oil dependency and low-income import countries, all groups show oil prices had significant influence on inflation. Adding the control variable the results have changed a lot, however, the data of control variables missing a lot for that period. For the second time period, 1980-2000 oil price is not correlated with inflation, implying that period inflation is mainly driven by other factors. In the last time period (2000-2014), for those groups: all countries, import countries, export countries, and high-income import countries oil price change will influence inflation. By adding the control variables low oil dependency countries' inflation is also impacted by oil price shock and the result becomes the same with 1971-1980. Overall, besides the time period 1980-2000, importing (especially high-income exporting countries) and exporting countries show a positive correlation between inflation and oil price change in all time periods. Moreover, the influence of oil prices on inflation has become weaker in recent decades.

Dependent variable: inflation

		1971-2014		1971-1980		1981-1999		2000-2014
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Controls	NO	YES	NO	YES	NO	YES	NO	YES
Panel A: all countries								
oil price volatility	0.0063	0.1200	0.0228***	0.0050	0.1830	1.2510	0.0305***	0.0360**
	(0.0658)	(0.2500)	(0.0044)	(0.0089)	(0.3310)	(1.1700)	(0.0106)	(0.0158)
Intercept	18.57***	-311.3**	9.877***	57.8900	34.60***	-327.9000	4.208***	-12.6200
	(3.3670)	(128.7000)	(0.4600)	(41.7400)	(6.8470)	(439.6000)	(0.2880)	(8.7600)
R-square	0.00	0.02	0.10	0.22	0.00	0.02	0.02	0.09
Panel B: import countries								
oil price volatility	0.0350***	0.0189***	0.0244***	0.0061	-0.0168	0.0075	0.0112**	0.0159***
	(0.0049)	(0.0059)	(0.0068)	(0.0099)	(0.0143)	(0.0164)	(0.0051)	(0.0052)
Intercept	4.759***	34.42***	9.124***	55.0600	5.213***	33.52***	2.256***	-1.4620
	(0.2550)	(3.7690)	(0.7090)	(52.1800)	(0.2950)	(6.2870)	(0.1410)	(3.9430)
R-square	0.12	0.40	0.15	0.18	0.01	0.34	0.04	0.12
Panel C: export countries								
oil price volatility	0.0424***	0.0254**	0.0373***		-0.0319	0.0159	0.0195***	0.0330***
	(0.0061)	(0.0122)	(0.0075)		(0.0210)	(0.0320)	(0.0059)	(0.0066)
Intercept	6.744***	30.24***	10.78***		8.048***	46.15***	2.787***	5.2730
	(0.3320)	(7.3680)	(0.7840)		(0.4330)	(12.6200)	(0.1620)	(4.9130)
R-square	0.11	0.25	0.24		0.01	0.44	0.08	0.27
Panel D: low oil dependency countries								

oil price volatility	-0.0449	0.2650	0.0168**	0.0066	0.9370	2.2240	0.0527	0.0551
	-0.2730	-0.6130	-0.0069	-0.0178	-1.2730	-2.4400	-0.0351	-0.0431
Intercept	51.32***	-763.8**	9.958***	76.7100	106.2***	-824.0000	5.423***	-10.7800
	-13.4300	-348.0000	-0.7230	-61.7400	-26.6300	-1088.0000	-0.9520	-23.4300
R-square	0.00	0.04	0.10	0.17	0.00	0.03	0.02	0.24
Panel E: high oil dependency countries								
oil price volatility	-0.0334	0.0369	0.0099		-0.2550	0.225**	0.0057	0.0337**
	(0.0763)	(0.0367)	(0.0116)		(0.3780)	(0.1030)	(0.0195)	(0.0163)
Intercept	15.99***	49.30**	10.42***		25.84***	89.7600	6.215***	34.37***
	(3.9430)	(24.6500)	(1.2380)		(7.7940)	(93.0300)	(0.5270)	(9.7450)
R-square	0.00	0.07	0.02		0.01	0.26	0.00	0.21
Panel F: low-income import countries								
oil price volatility	-0.0026	-0.0356	0.0033		-0.0750		0.0352	-0.0230
	(0.0128)	(0.0784)	(0.0156)		(0.0472)		(0.0268)	(0.0630)
Intercept	9.087***	19.2200	10.92***		10.99***		5.887***	24.3200
	(0.6210)	(17.9000)	(1.6260)		(0.9720)		(0.7310)	(25.4700)
R-square	0.00	0.16	0.00		0.03		0.02	0.07
Panel G: high-income import countries								
oil price volatility	0.0353***	0.0199***	0.0171**	0.0061	-0.0090	0.0212	0.0141***	0.0196***
	(0.0050)	(0.0058)	(0.0065)	(0.0099)	(0.0136)	(0.0149)	(0.0034)	(0.0036)
Intercept	4.306***	37.23***	9.875***	55.0600	4.234***	32.62***	1.601***	2.5900
	(0.2690)	(4.0510)	(0.6760)	(52.2200)	(0.2800)	(5.7750)	(0.0923)	(2.8330)
R-square	0.144	0.441	0.101	0.18	0.004	0.408	0.153	0.291

Notes: Controls include GINI coefficient, GDP per capita. ***, **, * indicate statistically significant at the 1%, 5%, 10% respectively.
Blank data means
the number of observations is to small no regression result has been returned.

Table 2. Regression results of inflation by oil price volatility

Step 2:

Dependent variable: total number of social unrests

	1971-2014		1971-1980		1980-2000		2000-2014	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Controls	NO	YES	NO	YES	NO	YES	NO	YES
Panel A: all countries								
Inflation	-0.00018	-0.00078	0.05560	0.22200	-0.00003	-0.00086	0.01020	0.01990
	(0.00067)	(0.00087)	(0.03370)	(0.28600)	(0.00063)	(0.00080)	(0.01910)	(0.02970)
Intercept	2.384***	9.559***	2.013***	-153.0**	2.348***	3.57300	2.240***	8.798**
	(0.07920)	(2.35700)	(0.43200)	(59.89000)	(0.10400)	(4.03100)	(0.13600)	(4.13700)
R-square	0.00000	0.02000	0.01100	0.23500	0.00000	0.02000	0.00100	0.01000
Panel B: import countries								
Inflation	0.14000***	0.32000***	0.12600	0.22000	0.107*	0.238*	(0.02050)	0.20000
	(0.03240)	(0.07230)	(0.08740)	(0.31500)	(0.05870)	(0.12700)	(0.12900)	(0.18100)
Intercept	2.556***	7.23200	2.954***	-176.3**	2.799***	0.78000	2.716***	8.66600
	(0.23600)	(4.53800)	(1.03500)	(74.42000)	(0.37600)	(7.48900)	(0.35900)	(6.76500)

ISSN 2959-6130

R-square	0.04800	0.16900	0.02800	0.24300	0.02100	0.08200	0.00000	0.04000
Panel C: export countries								
Inflation	0.01830	0.214**	0.09180		0.05290	0.327*	-0.03140	0.10500
	(0.02510)	(0.09460)	(0.05800)		(0.03560)	(0.17500)	(0.15800)	(0.25700)
Intercept	3.184***	7.99200	2.448***		2.718***	-17.68000	3.430***	4.58800
	(0.24900)	(7.55400)	(0.84400)		(0.34900)	(13.01000)	(0.54800)	(12.14000)
R-square	0.00100	0.06400	0.03000		0.01400	0.25600	0.00000	0.01100
Panel D: low oil dependency countries								
Inflation	-0.00011	-0.00031	0.05150	0.22600	-0.00005	-0.00070	0.01270	0.02150
	(0.00085)	(0.00104)	(0.12600)	(0.46800)	(0.00069)	(0.00080)	(0.02840)	(0.03860)
Intercept	2.996***	23.50***	2.955*	-172.0*	2.632***	13.12*	3.088***	18.18**
	(0.19900)	(4.73300)	(1.49300)	(92.50000)	(0.22900)	(6.86500)	(0.30700)	(8.07600)
R-square	0.00000	0.09800	0.00300	0.28900	0.00000	0.05500	0.00200	0.04000
Panel E: high oil dependency countries								
Inflation	-0.00228	-0.03380	0.04180		0.00047	0.00448	0.06570	-0.03090
	(0.00309)	(0.03430)	(0.06000)		(0.00227)	(0.03420)	(0.06380)	(0.17800)
Intercept	2.129***	6.26500	1.14400		1.527***	-9.76400	2.514***	19.01000
	(0.18500)	(7.55100)	(0.77600)		(0.18200)	(16.42000)	(0.48500)	(13.09000)
R-square	0.00200	0.01600	0.01100		0.00000	0.04200	0.01200	0.03000
Panel F: low-income import countries								
Inflation	0.01760	0.01800	0.05520		0.01450		0.01110	0.02870
	(0.01190)	(0.02010)	(0.06060)		(0.00937)		(0.01820)	(0.02320)
Intercept	0.454***	-3.620**	0.38800		0.302**		0.529***	0.12200
	(0.15100)	(1.51500)	(0.83200)		(0.13400)		(0.16000)	(1.78500)
R-square	0.01000	0.40700	0.02300		0.02700		0.00400	0.33100
Panel G: high-income import countries								
Inflation	0.17400***	0.33100***	0.14200	0.22000	0.198***	0.335**	0.00959	(0.03830)
	(0.03700)	(0.07790)	(0.10800)	(0.31500)	(0.07350)	(0.14500)	(0.20100)	(0.25200)
Intercept	2.250***	9.149*	2.392*	-176.4**	2.318***	0.30100	2.468***	13.12*
	(0.25400)	(5.12900)	(1.27800)	(74.47000)	(0.38700)	(7.82600)	(0.39900)	(7.19600)
R-square	0.06800	0.19200	0.02700	0.24300	0.05500	0.12400	0.00000	0.05300

Notes: Controls include GINI coefficient, GDP per capita. ***, **, * indicate statistically significant at the 1%, 5%, 10% respectively. Blank data means the number of observations is to small no regression result has been returned.

Table 3. Regression results of number of civil unrests by inflation

Table 3 shows the correlation between inflation and the number of civil unrests. In Table 3, xxx means the sample size is less than 10, and the dependent variable is the total number of civil unrests happening in a year. For the whole time period from 1971 to 2014 only importing countries' number of civil unrest is relevant to the inflation, with a 1% increase of CPI there will be 0.14 more civil unrest. After breaking the importing countries into high-income and low-income countries, the correlation only applies to high-income countries, a 1% CPI increase leads to 0.174 more civil unrest. Both results hold after adding control variables, the impact of inflation on the number of civil unrests almost doubled. When we looked into different time periods all results became insignificant besides the high import countries during the 1980-2000. However, for the first one and half decades in 21th century the impact of inflation on the number of civil unrests within those high-income importing countries become insignificant, moreover, the R-square for the time period 1970-2000 is not very large implies that the inflation do have influence on the number of civil unrest but it is not the main cause of civil unrest.

For the time period 1971-2014, we found that inflation has a significant influence on the number of social unrests in those oil importing countries, especially those high-income importing countries. The oil price shock also has a

significant influence on the high-income import countries' inflation level. We conclude that the oil price shock has a significant positive influence on high-income importing countries' number of civil unrest, 1% increase of oil price can lead to an increase of inflation among those countries increased by 0.0353% and 1% increase of inflation can cause 0.174 more civil unrest, so 1% increase of oil price can leads to 0.0353*0.174=0.00614 more civil unrest happening in those high-income importing countries.

5. Discussion

According to our result we found that among those high-income oil importing countries the oil price change has a significant influence on the inflation and inflation has a significant influence on the number of civil unrests. We conclude that the oil price change has a positive impact on the number of civil unrests among high-income oil importing countries.

Research about the natural resource curse suggested that oil wealth is associated with political unrest and civil wars (Le Billon 2004, Ross 2012). However, there are not many papers directly studying the relationship between oil price volatility and civil unrest. Relevant research by Vadlamannati (2020) found that social unrest is conditionally related to oil price volatility, for oil-importing countries high oil prices will lead to more social instability which fits our result. They have also found that oil exporting countries will suffer more social unrest when oil prices are low, however, our result shows that the impact of oil price volatility is not correlated with civil unrest among those oil exporting countries, the different results could be caused by the use of media variables. In those exporting countries oil prices might be directly related to social unrest rather than indirectly related, when the oil prices are low, there will be more unemployment and rulers may lack the money to maintain social stability by buying off opposition (Acemoglu and Robinson 2012, Basedau and Lay 2009). As for low oil dependency countries, it is not surprising that oil doesn't have an influence on the number of civil unrest due to their low dependency on oil. To high oil dependency countries, those countries are most likely to be the product exporter, although high oil prices will lead to higher inflation it will not immediately lead to unemployment which may cause more civil unrest.

5.1 Policy Implication:

Our result shows that different periods of time and different countries' groups matter a lot in determining the relationship between oil price volatility and civil unrest, therefore, the policy recommendations for each specific group should also be flexible and well-targeted.

From 1970 to 1980, the impact of oil prices on inflation and civil unrest was significant, whereas the relationship became insignificant between 1980 and 2000, which might suggest that civil unrest was not primarily driven by changes in oil prices. However, from 2000 to 2014: The impact of oil prices on inflation and civil unrest became significant again. Based on the changing relations between oil prices and civil unrest, it is important for policymakers to notice that these two factors are not always strongly correlated, in other to prevent social unrest from happening, focusing on regulating oil prices and inflation wouldn't been the solely effective ways to reduce crime, inequalities, or violence. A balanced redistribution system and established legal frameworks are also crucial in maintaining peace and security.

Besides, for different country groups, the impacts of oil prices on civil unrest are also different. Generally, high-income countries are susceptible to oil price changes because fewer other economic and social factors influence civil unrest. Also, rich countries have better institutions to maintain social stability, which indicates that policy-making in richer countries will be more effective and specific in tackling the effects of oil prices and inflation on civil unrest, whereas poorer countries suffer from various factors of instability other than oil price, or inflation, which means policymakers in those countries should avoid putting all resources in one specific issue. Instead, they should set up multifaceted policies that aim to elevate the level of equality, providing better social opportunities, or promoting institutional refinement.

6. Conclusion

The price of oil is an important variable in the global economy, and its impact is very wide-ranging, encompassing economic, political, and social aspects. Specifically, fluctuations in oil prices are often closely related to the political instability of oil-producing countries and consequently have a significant impact on the level of social unrest in those countries. For example, the violent unrest in Kazakhstan in early 2022 can be attributed in part to the rise in domestic oil prices, which has led to an increase in the cost of living and a build-up of social discontent. Similarly, when the era of low oil prices arrives, some countries may erupt in civil unrest due to economic hardship and social dissatisfaction. Therefore, studying the impact of oil prices on social unrest is of significant social and practical importance.

In this paper, we aim to find whether there is a relationship between oil price change and the number of civil unrests happening in countries of different income levels, oil trading types, and the level of dependency on oil. We

ISSN 2959-6130

use inflation (CPI) as our media variable and oil price volatility (%of oil price change each year), number of civil unrests as our main variables, income inequality (GINI), and GDP per capita as control variables to form a panel dataset. We use this dataset to conduct our research by doing simple regression. As a result, we found that among all our country groups oil price change only has an impact on the number of civil unrests in those high-income importing countries. A 20% oil price increase could lead to about 0.12 more civil unrest in high-income importing countries.

From our research, we have found oil price shocks influence the number of civil unrests for the whole time period (1971-2014), but after breaking the time into three periods all periods have shown insignificant correlation, which is worth further study. Moreover, we have chosen CPI as the indicator of inflation, however, not all countries have the same component of CPI. Some countries may suffer a lot due to oil price increases some may not, but there could be some better methods to measure inflation. Using a better measurement of CPI will help the research result be more reliable and precise. The last question we have left is the different types of civil unrest, we have seen there are large/small violent/non-violent civil unrest, whether oil prices have an impact on certain types of civil unrest and which types are them is also what we wish to find out in future.

Acknowledgement

Lufan Chen, Zhibin Li, Qiheng Wang and Yixi Wang contributed equally to this work and should be considered co-first authors. Names are ordered alphabetically by the first letter of the last name.

References

[1] Thomson, H., Bahgat, K., Urdal, H., & Buhaug, H. (2023). Urban Social Disorder 3.0: A global, city-level event dataset of political mobilization and disorder. Journal of Peace Research, 60(3), 521-531.

[2] Wang, Y., Wu, C., & Yang, L. (2013). Oil price shocks and stock market activities: Evidence from oil-importing and oil-exporting countries. Journal of Comparative Economics, 41(4), 1220-1239.

[3] Akinsola, M. O., & Odhiambo, N. M. (2020). Asymmetric effect of oil price on economic growth: Panel analysis of low-income oil-importing countries. Energy Reports, 6, 1057-1066.

[4] Vadlamannati, K. C., & De Soysa, I. (2020). Oil price volatility and political unrest: Prudence and protest in producer and consumer societies, 1980–2013. Energy Policy, 145, 111719.

[5] Sek, S. K., Teo, X. Q., & Wong, Y. N. (2015). A comparative study on the effects of oil price changes on inflation. Procedia Economics and Finance, 26, 630-636.

[6] Choi, S., Furceri, D., Loungani, P., Mishra, S., & Poplawski-Ribeiro, M. (2018). Oil prices and inflation dynamics: Evidence from advanced and developing economies. Journal of International Money and Finance, 82, 71-96.

[7] Nusair, S. A. (2019). Oil price and inflation dynamics in the Gulf Cooperation Council countries. Energy, 181, 997-1011.

[8] Friedman, M. (1977). Nobel lecture: inflation and unemployment. Journal of political economy, 85(3), 451-472.

[9] Swastika, P., & Masih, M. (2016). Do interest rate and inflation affect unemployment. Evidence from Australia. MPRA Paper, (100067). Swastika, P., & Masih, M. (2016). Do interest rate and inflation affect unemployment. Evidence from Australia. MPRA Paper, (100067).

[10] Waud, R. N. (1970). Inflation, Unemployment, and Economic Welfare. The American Economic Review, 60(4), 631-641.

[11] Moubarak, R. (2014). The Economic Determinants of Civil Unrest: a Cross-National Study.

[12] Sween, J., & Clignet, R. (1969). Urban unemployment as a determinant of political unrest: The case study of Douala Cameroon. Canadian Journal of African Studies/La Revue canadienne des études africaines, 3(2), 463-488.

[13] Siami-Namini, S., & Hudson, D. (2019). Inflation and income inequality in developed and developing countries. Journal of Economic Studies, 46(3), 611-632.

[14] Jin, Y. (2009). A note on inflation, economic growth, and income inequality. Macroeconomic Dynamics, 13(1), 138-147.

[15] Law, C. H., & Soon, S. V. (2020). The impact of inflation on income inequality: the role of institutional quality. Applied Economics Letters, 27(21), 1735-1738.

[16] Albanesi, S. (2007). Inflation and inequality. Journal of monetary Economics, 54(4), 1088-1114.

[17] Wilkinson, R. G., & Pickett, K. E. (2009). Income inequality and social dysfunction. Annual review of sociology, 35(1), 493-511.

[18] Alesina, A., & Perotti, R. (1996). Income distribution, political instability, and investment. European economic review, 40(6), 1203-1228.

[19] Thoresen, P. E. (1982). Oil price and inflation. Energy economics, 4(2), 121-126.

[20] LeBlanc, M., & Chinn, M. D. (2004). Do high oil prices presage inflation? The evidence from G-5 countries.

[21] Ross, M. L. (2012). The oil curse: How petroleum wealth shapes the development of nations. Princeton University Press.

[22] Le Billon, P. (2004). The geopolitics of resource wars. Routledge.

[23] Daron, A., & Robinson, J. A. (2012). Why nations fail: The origins of power, prosperity, and poverty. New York: Crown Business.

[24] Basedau, M., & Lay, J. (2009). Resource curse or rentier peace? The ambiguous effects of oil wealth and oil dependence on violent conflict. Journal of peace research, 46(6), 757-776.