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A Case Study of Yemen
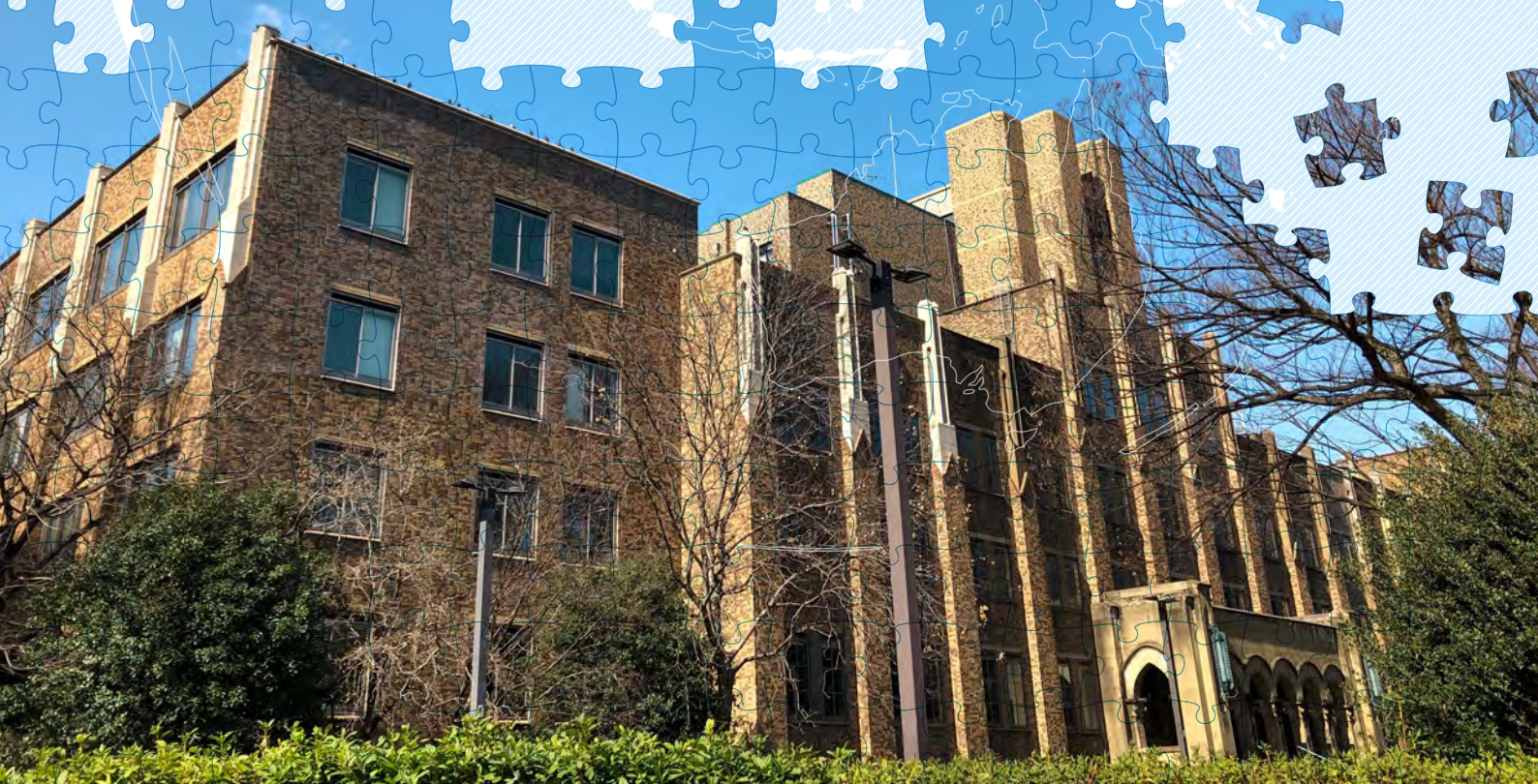
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Impact of Arab Spring Events on Food Prices: A Case Study of Yemen

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Abstract:

The Arab Spring began with the hope of restoring democracy but ended in a conundrum, and its economic costs remain to be estimated. This study aims to estimate the economic cost of the Arab Spring in terms of food inflation. Adopting a case study approach, we focus on Yemen, a country that experienced the Arab Spring starting in January 2011. The Arab Spring is defined as the series of events that the country experienced after the movements started in January 2011. We employ difference-in-differences (DiD) with propensity score matching as an identification strategy to address selection bias. We consistently find that the Arab Spring significantly increased food prices in Yemen. This study provides policy implications for relevant stakeholders regarding the associations between political conflicts and food security dynamics.

Keywords: Arab Spring, Revolution, Food Price, Economic Cost, Conflict

1. Introduction

After decades of political hibernation, the Arab world witnessed protests and revolutions, with large-scale revolutions in six countries: Tunisia, Syria, Egypt, Yemen, Libya and Bahrain (Grinin & Korotayev, 2022). Political factors, such as internal conflicts, religious diversity, authoritative government systems and a lack of transparency, are considered major causes of the Arab uprisings (Korotayev et al., 2022; Barakat & Fakih, 2020). The revolutions were further driven by poverty, unemployment, and a shortage of economic opportunities (Malik & Awadallah, 2013), as well as economic factors, such as economic stagnation (Grinin & Korotayev, 2022), and food security (Soffiantini, 2020).

The Arab Spring started with the hope of achieving democratic and economic restoration but ended in a conundrum. The movement failed to achieve social, economic or political improvements for the countries that experienced it. In addition, the revolutions termed Arab uprisings failed to resolve internal conflicts and instead led to complex political situations (Haynes, 2020). Furthermore, the social media-led movement served as a catalyst for a worldwide surge in sociopolitical destabilization that far surpassed the magnitude of the Arab Spring itself (Korotayev et al., 2022). The Arab Spring has been described as an initiator of terrorism, hampering peace and development (Fraihat & Yaseen, 2020; Schumacher and Schraeder, 2021; Issaev, 2020). In addition, the movement is associated with a reduction in economic growth, gross domestic production, foreign direct investment and tourism income (Echevarría & García-Enríquez, 2020). Conflict-affected countries that experienced the Arab Spring have consistently experienced inflation of approximately 10% (AlShammari et al., 2023). The Arab Spring caused the food security of the affected countries to deteriorate, as evidenced by the fact that twenty million people in Yemen are food insecure and 10 million people have

experienced famine (Basha, 2023). However, no study has examined the causal impact of the Arab Spring on food prices. We thus examine the impact of the Arab Spring on food prices, taking Yemen as a case study because it is considered one of the countries most strongly affected by the Arab Spring.

The economic cost of the Arab Spring has yet to be estimated. This study aims to estimate the economic cost of the Arab Spring in terms of food inflation. We consider Yemen to have experienced the Arab Spring since January 2011 and define the Arab Spring as the series of events that the country experienced after the movements starting in January 2011. The difference-in-differences (DiD) approach with propensity score matching is applied as an identification strategy to address selection bias. In this study, 69 districts of Yemen are considered treated districts, and 145 districts of the neighboring countries of Somalia and Kenya are considered control districts. Food prices are based on the Food Price Index, with January 2010 as the base month. The main research question of the study is as follows:

RQ: What is the impact of the Yemeni Arab Spring on food prices in Yemen?

This research is grounded in Goldstone et al.'s (2022) Phenomenon and Theories of Revolutions, which posits that a revolution represents a distinct mechanism for altering governmental or political (or even social and political) regimes. However, the revolutionary upheaval of political regimes typically results in a significant breakdown in the system's functionality, often leading to unpredictable outcomes. Consequently, revolutions have been recognized as highly disruptive and potentially devastating approaches to social change and sometimes become counterproductive forces against progress (Goldstone et al., 2022). In this study, we examine the empirical evidence from the perspective of the Phenomenon and Theories of Revolution and explore how the Arab Spring has affected the economic factor of food inflation. By examining

the associations between political conflicts and food security dynamics, we provide useful policy implications for relevant stakeholders.

2. Background

2.1 Historical Background

Yemen experienced the Arab Spring as a form of pro-democratic protest against the three-decade rule of President Ali Abdullah Saleh (Issaev et al., 2022). The Yemeni people started the movement with the hope of political reformation, the end of corruption and greater economic potential. The basic causes of the movement can be attributed to the high unemployment rate, food insecurity and the scarcity of social services (Abdulkader, 2023). Youth were persistently at the center of the Yemeni Arab Spring, and social media was used as a tool to organize the movement and achieve mobilization. The Yemeni government dealt with the movement with an iron hand and suppression. As a result, the movement turned into long-term, violent local conflicts between protesters and security forces. The attempts of the government to suppress the movement aggravated the situation, and a new group of military and tribal actors emerged in opposition to the government. The fragmentation of the elite society resulted in the weakening of the Yemeni government (Juneau, 2013). In November 2011, President Saleh was forced to accept an agreement for a peaceful transition of power to Vice President Abd-Rabbu Mansour Hadi (Durac, 2012). Although the transition process was intended to be smooth, Yemen faced diverse challenges, including ongoing protests, the presence of Al-Qaeda in the Arabian Peninsula (AQAP), and internal conflicts. Furthermore, the Houthi rebel group capitalized on the power vacuum, complicating the political landscape of Yemen. In 2014, Houthi rebels captured the capital, Sana'a, and other key areas, plunging Yemen into a full-blown civil war (Brandt, 2024). The conflict was further aggravated as a Saudi-led coalition intervened in 2015 to restore

the internationally recognized government of President Hadi and counter the influence of the Houthi rebels. The Yemeni civil war has resulted in the world's most severe humanitarian crises, causing displacement, a crumbling economy, and a dire humanitarian situation, including food and medical shortages (Al Iriani et al., 2023).

2.2 Academic Background

Many studies have examined diverse aspects of the Arab Spring. Korotayev et al. (2022) examined the causes of the Arab Spring and suggested that the main causes were the existence of internal conflicts within the elite, the diversity of religious and tribal groups, the lack of efficient mechanisms for transferring power, and the absence of safeguards against internal conflicts. Furthermore, Grinin and Korotayev (2022) attributed the Arab Spring to extremist concepts and ideologies in the community, accelerated urbanization, a rising proportion of youth in the population, and the juxtaposition of swiftly advancing education levels for a segment of the populace with inadequate education for others. Soffiantini (2020) argued that food insecurity was one of the key factors of the Arab Spring, while Barakat and Fakih (2020) argued that political grievances were more related to the Arab uprisings than economic factors were.

Studies have traced how the Arab uprisings have changed the social, economic and political regime in the last decade. Haynes (2020) argues that the conflicts associated with the Arab uprisings have not abated in the last ten years, resulting in a complicated political situation. Fraihat and Yaseen (2020) argued that the Arab Spring failed to achieve social change and instead destabilized the Arab world and prevented peace and development in the long run. Schumacher and Schraeder (2021) argued that the Arab Spring resulted in a global surge of terrorism and ultimately destabilized the political conditions of Arab countries. Similarly, Issaev (2020) argued that the Arab Spring weakened governments, creating an environment suitable for

terrorism. Moreover, Aras and Oztig (2021) argued that the Arab movements from 2011 to 2014 failed to bring any political change but instead represented a learning opportunity for authoritarian governments and ultimately lead to more repression of citizens and greater control over social media.

Studies have estimated the economic costs of the Arab Spring. Echevarría and García-Enríquez (2020) argued that the Arab Spring reduced the GDP of Egypt by 12.04%. Kırşanlı (2023) found that the Arab Spring reduced economic growth by approximately 2.98% because of the increase in corruption. Moreover, Jha and Kırşanlı (2023) reported that the Arab Spring further democratized corruption, resulting in increased economic inequality. Ghazalian (2023) argued that the Arab Spring significantly reduced foreign direct investment, and Groizard et al. (2022) found that tourism decreased significantly in countries affected by the Arab Spring. Becheikh (2021) showed that the Arab movements failed to improve economic conditions.

Although previous studies have explored diverse and crucial aspects of the Arab Spring, some unsolved questions remain. We explore these questions to address the gaps in related research. First, this study is the first to examine the causal impact of the Arab Spring on food inflation. Second, we explore the economic cost of the Arab Spring via district-level analysis, which provides microlevel impact analysis. Third, we attempt to link the empirical evidence with the theoretical foundation of revolutions. Furthermore, we provide empirical evidence supporting the Phenomenon and Theories of Revolution.

3. Materials and Methods

3.1 Data Source

The dataset prepared by Andree et al. (2020) is used in the present study. We consider three countries: Yemen, Somalia and Kenya. We use monthly panel data from January 2007 to

February 2020. Sixty-nine districts in Yemen are included as treated districts, whereas 145 districts in Somalia and Kenya are included as control districts.

3.2 Summary Statistics

Table 1 provides summary statistics categorized by whether districts experienced the Arab Spring, with districts in Yemen treated as experiencing the Arab Spring and districts in Kenya and Somalia considered control districts. The data reveal that the treated districts present a significantly higher average food price index than the control districts do. Additionally, the control districts present approximately twice the vegetation index and approximately four times the average rainfall of the treated districts. Compared with the control districts, the treated districts experience approximately two and a half times more violent events. Moreover, the treated districts experienced approximately three times more fatalities than the control districts. The average population of the treated districts does not significantly differ from that of the control districts. The treated districts have an area approximately 25% smaller than that of the control districts. The percentage of cropland in the control districts is approximately 25% greater than that in the treated districts. Finally, the percentage of pastureland in the control districts is approximately 100% greater than that in the treated districts.

Table 1: Summary Statistics

Variables	Treatment	Standard Deviation	Control	Standard Deviation	Difference	Standard Error
Food Price Index	1.94	[1.09]	1.15	[0.31]	-0.79***	(0.01)
Vegetation Index	0.19	[0.09]	0.39	[0.20]	0.20***	(0.00)
Average Rainfall	2.76	[3.38]	10.39	[12.76]	7.63***	(0.12)

Number of Monthly Violent Events	3.68	[14.96]	1.41	[4.57]	-2.27***	(0.11)
Number of Monthly Fatalities	8.35	[40.14]	2.26	[10.68]	-6.09***	(0.28)
Population	368610.58	[538688.91]	372538.07	[444402.89]	3927.49	(5548.12)
Area	6595.19	[21753.34]	8335.91	[10226.45]	1740.72***	(173.92)
% of Cropland	20.10	[23.30]	25.26	[26.54]	5.15***	(0.30)
% of Pasture	28.72	[24.87]	54.09	[28.17]	25.37***	(0.32)

3.3 Identification Strategy

A movement to restore democracy is not an arbitrary event; rather, it is dependent on the geopolitical context of a country. Thus, the estimation of the impact of movements such as the Arab Spring is susceptible to selection bias. We employ the difference-in-differences (DiD) method with propensity score matching as the primary identification strategy to address this bias, assuming that there is a parallel trend between treated and control households (Goodman-Bacon, 2021). The average treatment effect on the treated (ATT) can be estimated by contrasting the average change in the outcome of the treated group from that of the control group (Callaway & Sant'Anna, 2021). In essence, DiD compares the treated and control units on the basis of the assumption that the outcome variable should exhibit a parallel trend among them over the specified period; this method serves to mitigate endogeneity issues (Wooldridge, 2023). Additionally, DiD with propensity score matching is utilized to correct biases when the assumption of a nonparallel trend is made (Ryan et al., 2019). The average treatment effect is estimated via a specified equation:

$$\text{Outcome}_{it} = \alpha_0 + \alpha_1 \text{Interaction}_{it} + \pi \text{PScore}_{it} + + \beta \text{DistrictDummy}_t + \mu \text{ MonthDummy}_i + u_{it}$$

where $Outcome_{it}$ refers to the log of the food price of district i in month t. $Interaction_i$ is the interaction of $Post\ dummy_t$ and $Treatment\ dummy_i$. A post dummy variable is generated, which takes a value of 1 if the date is after January 2011, so Post=1 if Time≥January 2011. The treatment dummy variable takes a value of 1 if the district belongs to Yemen and 0 if the district belongs to Somalia or Kenya. The interaction term of the treatment dummy variable and postdummy variable is then generated. The estimator α_1 is the DiD estimation of the average treatment effect. $PScore_{it}$ is the propensity score of district i in month t and is used as a control variable to compare similar districts among the treated and control households. The month fixed effects and district fixed effects are expressed by the coefficients μ and β, respectively, to address potential unobserved heterogeneity on the basis of month and district differences. As a robustness check, we apply synthetic DiD, in which treated and untreated units are matched before the treatment trend to reduce the dependence on the parallel trend assumption of DiD (Arkhangelsky et al., 2021). The unit-level weight and time weight are added to the synthetic DiD regression. The unit-level weight helps match the treated and untreated units according to the parallel trends before treatment, and the time weight ensures that the pretreatment periods receive greater weight (Pailañir & Clarke, 2023).

4. Results and Analysis

4.1 Main Results

The main results of the study, shown in Table 2, show that the Arab uprising in Yemen significantly increased food prices. The first column of Table 2, presenting the results of a basic DiD model, shows that the Arab uprising in Yemen increased food prices by 0.38%. The second column presents the results of the DiD estimation with monthly fixed effects, indicating that the

Arab uprising in Yemen increased food prices by 0.38%. The third column presents the DiD results with both monthly and district-level fixed effects, indicating that the Arab uprising in Yemen increased the food price by 0.38%. Finally, the fourth column shows the results of DiD with PSM estimation, which reveal that the Arab uprising in Yemen increased the food price by 0.38%. The results consistently show that the Arab uprising in Yemen increased food prices.

Table 2: Average Treatment Effect of the Arab Spring Events on Food Prices

| Variables	(1) Log Food Price	(2) Log Food Price	(3) Log Food Price	(4) Log Food Price
Average Treatment Effect	0.381***	0.381***	0.381***	0.381***
	(0.004)	(0.003)	(0.003)	(0.003)
Post Dummy	0.165***	-	-	-
	(0.002)			
Propensity Score	-	-	-	28.90***
				(2.061)
Month Fixed Effect	N0	Yes	Yes	Yes
District Fixed Effect	No	No	Yes	Yes
Constant	0.639***	0.514***	0.514***	-8.802***
	(0.006)	(0.010)	(0.009)	(0.66)

Note: Standard errors are in parentheses. Significance levels are determined via a robust method where $*$ indicates $p < 0.10$, $**$ indicates $p < 0.05$, and $***$ indicates $p < 0.01$.

Figure 1 shows the time trend of the food price of both treated and untreated districts. The figure shows that the time trends for the treated and untreated districts suddenly diverged after the Arab Spring started in Yemen in January 2011. After January 2011, the food price in Yemen increased radically, as evidenced by the sharp upward trend in the food prices of Yemen in comparison with those of Somalia and Kenya, which did not experience the Arab Spring.
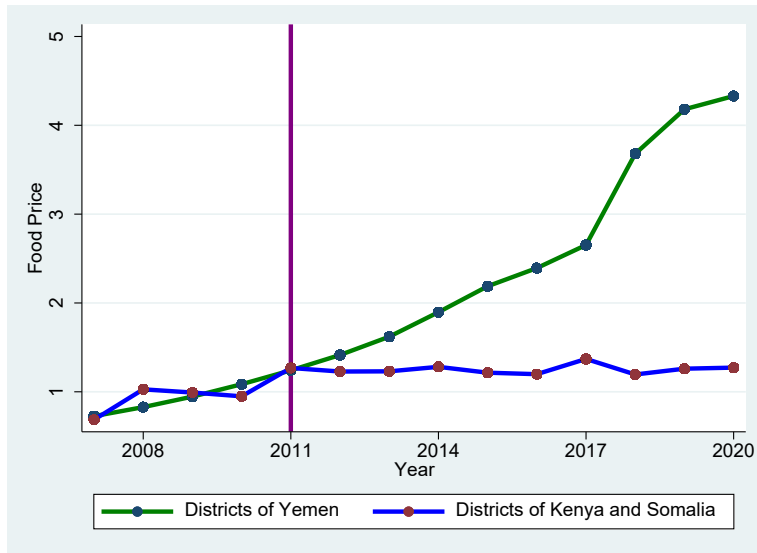
Fig. 1: Time Trend of Food Price

Furthermore, Figure 2 shows the histogram of Yemen in comparison to Somalia and Kenya. The graph shows that the food price indexes of both the districts of Yemen and the districts of Somalia and Kenya were much lower than 2 before January 2011. However, after January 2011, the food price index of districts in Yemen reached 5, and the indexes of the districts in Somalia and Kenya were lower than 2.5. The histogram suggests that the food price index of Yemen increased significantly after January 2011, when the Arab Spring began.
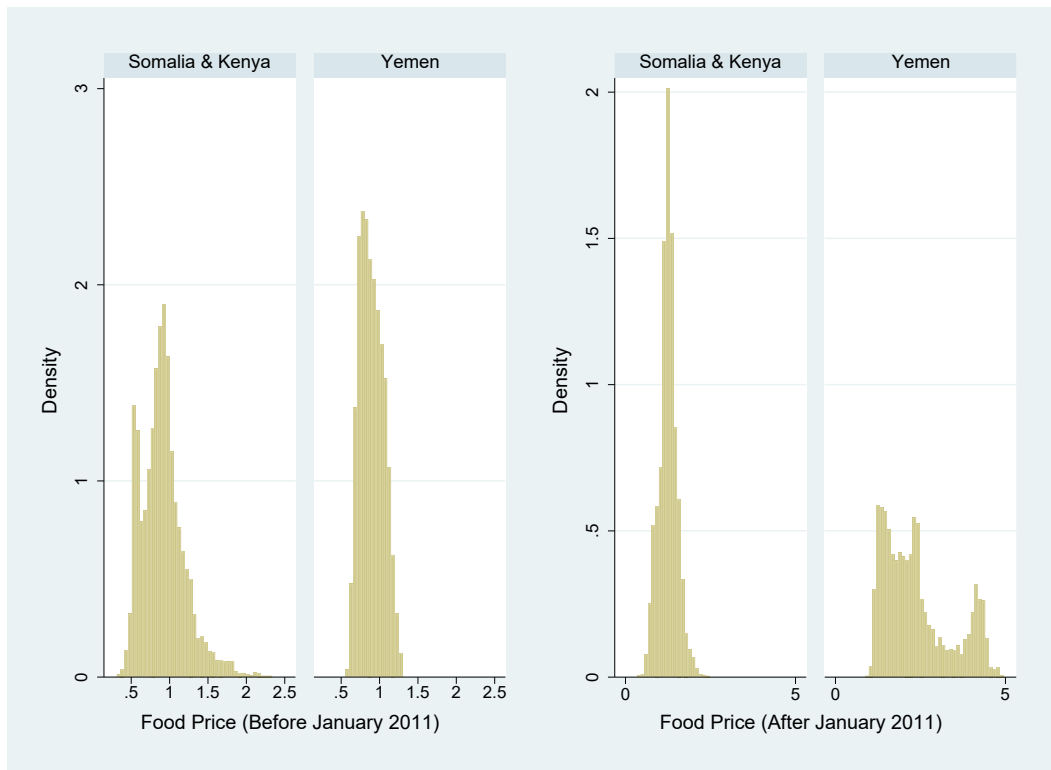
Fig 2. Histogram of Food Prices before and after the Arab Spring

4.2 Subsample Analysis

Table 3 presents the subsample analysis of the impact of the Arab Spring with Somalia and

Kenya considered separately. In comparison with Somalia and Kenya, the control countries,

Yemen experienced increases of 46.10% and 28.70% in food prices, respectively.

Table 3: Subsample Analysis of the Effects of the Arab Spring on Food Prices

Variables	Only Somalia as a Control Log Food Price	Only Kenya as a Control Log Food Price
Average Treatment Effect	0.461***	0.287***
	(0.004)	(0.003)

Note: Standard errors are in parentheses. Significance levels are determined via a robust method

where ∗ indicates p < 0.10, ∗∗ indicates p < 0.05, and ∗∗∗ indicates p < 0.01.

4.3 Robustness Check

Table 4 reports the results of the synthetic DiD estimation, which reveal that the Arab Spring increased the food prices of Yemen by 40.45%. This estimate reports the average treatment effect on the treated. The results consistently show that the Arab Spring had an aggravating effect on food prices.

Table 4 Impact of the Arab Spring on Food Prices in Yemen

Outcome	Average Treatment Effect on Treated
Log of Food Price	0.4045***
	(0.0039)

Notes: Significance levels are determined via a robust method where ∗ indicates p < 0.10, ∗∗ indicates p < 0.05, and ∗∗∗ indicates p < 0.01.

5. Discussion

The study findings consistently reveal that the Arab Spring and the associated events significantly increased food prices in Yemen. This study provides empirical evidence of the devastating impact of revolution. The Arab Spring was intended to restore democracy and economic stability in Arab countries, such as Yemen. However, the social media-driven revolution worsened the political and economic landscape of Yemen. Food prices were severely impacted in the aftermath of the series of conflicts triggered by the Arab Spring.

Food inflation is a crucial indicator of welfare. Food inflation is believed to significantly reduce the welfare of citizens (Alem & Köhlin, 2014) and increase the poverty rate (Dessus et al., 2008); thus, the Arab Spring indirectly reduced welfare. Food inflation can be attributed to the social, economic and political changes resulting from the Arab Spring. The Arab Spring resulted in long-term conflict (Haynes, 2020) and destabilized the political situation of the Arab world. Moreover, the Arab Spring enhanced terrorism by weakening governments (Schumacher &

Schraeder, 2021; Issaev, 2020). No improvement in political change was made through the Arab Spring (Aras & Oztig, 2021). Increasing conflict, political instability, the emergence of terrorism and weakening government capacity characterized the political context and caused food prices to rise.

Economically, the Arab Spring significantly reduced GDP, FDI and tourism (Echevarría & García-Enríquez, 2020; Ghazalian, 2023; Groizard et al., 2022), hampering growth and development (Fraihat & Yaseen, 2020). Furthermore, food inflation is said to be triggered by supply shocks resulting from the Arab Spring (Bandara, 2013). The economic environment deteriorated after the Arab Spring, and the galloping food price inflation should be considered a consequence of all the factors associated with the Arab Spring. We suggest that the Arab Spring led to the deterioration of food security in Yemen by significantly increasing food prices.

The Arab Spring may have had heterogeneous impacts on food prices based on the context of each country. This study reveals that Yemen experienced food inflation as a result of the Arab Spring. In other words, the Arab Spring led to events that triggered food inflation in Yemen. This finding provides empirical evidence supporting the Phenomenon and Theories of Revolution (Goldstone et al., 2022), which suggests that revolutions are disruptive and potentially devastating approaches to socioeconomic progress. Although the Arab Spring started with the hope of development and growth, the result has been significant socioeconomic losses. Our findings are consistent with those of Echevarría and García-Enríquez (2020), who argued that the Arab Spring significantly reduced GDP. The increase in food prices is expected to deteriorate food security in Yemen and reflects the devastating impact of the Arab Spring in the long run.

6. Conclusion

This study provides policy implications for relevant stakeholders, suggesting that revolutions ultimately deteriorate food security conditions. Governments should involve citizens in policy making to make development inclusive so that international actors cannot exploit citizens' grievances to create unrest. Furthermore, dialogs need to replace debates to eliminate long-lasting conflicts, and governments should ensure inclusive and equitable economic growth. Finally, participatory government systems should be upheld to promote peace, which results in economic stability.

This study has several limitations that need to be considered when interpreting the findings. First, Yemen is taken as a case study, but the Arab Spring may have had diverse impacts across countries depending on the national context. Second, the control countries, Kenya and Somalia, are selected because they are neighboring countries and were not affected by the Arab Spring, but other countries could have been selected. Third, food prices do not present parallel trends before the Arab Spring. To address this issue, we use both DiD with PSM and synthetic DiD, identification strategies that attenuate the requirement of parallel trends. Future research could explore the impacts of the Arab Spring on food inflation across different countries and on diverse economic factors.

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