“Feed the mouth, the eye ashamed”: Have Food Prices Triggered Social Unrest in Egypt?

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Abstract

A monthly panel dataset was used to empirically examine the role of food prices in the emergence of social unrest in various geographic regions of Egypt between 1998 and 2013. A media discourse analysis traced reports in two leading Egyptian newspapers about social unrest, overall dissatisfaction with the government, and food price inflation. A fixed effects binary logit panel model has found that the probability of social unrest is statistically related to macroeconomic control variables such as domestic and global food prices, and GDP per capita. Higher temperatures were associated with an increased likelihood of social unrest through their influences on food production and yields, and price volatility in domestic food markets. In addition, the results support to the hypothesis that social unrest in developing countries has a strong "spatial" dimension, where urban dwellers were found to have a greater capacity to engage in collective action leading to social unrest. Finally, media reports about food price inflation were also statistically related to the occurrence of social unrest; but the estimated effect of overall dissatisfaction with institutional quality is even higher. Overall, the results suggest that soaring food prices, despite significant, were unlikely the single most important reason for social unrest in Egypt.

Keywords: food price volatility, social unrest, Arab spring, Egypt, panel data, media discourse

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1. Introduction

Historically, social unrest has often coincided with periods of high and volatile food prices (Bellemare, 2015). Between 2008 and 2011, spikes in international food and agricultural commodity prices had severely affected vulnerable population groups in developing countries and resulted in dramatic rioting, often termed 'food riots' in many countries in African, Asia and other developing regions (Lagi et al., 2011). This apparent simultaneity between food price inflation and food price volatility on the one hand, and on the other hand the likelihood for sociopolitical unrest to occur, has fueled a renewed interest in understanding the interlinkages and the channels through which food prices may cause social unrest (e.g. Arezki and Brückner, 2011; Raleigh et al., 2015). Despite their widespread occurrence, these food riots did not take place in all developing countries, stimulating further research into the spatial and temporal determinants of food-related unrest in developing countries. Understanding the root causes and mechanisms of social unrest is critical to inform policy reforms in order to address people's grievances and break their link with food riots and sociopolitical instability (Heslin, 2020). Extant evidence suggests that social unrest in developing countries is complex and multifaceted phenomenon that does not have a singular cause. However, rising food prices often fuel the already existing combustible mix of political, economic and social grievances (e.g. poverty, inequality, unemployment, rural-urban division), heighten social tensions and spark protests and revolts (Harrigan, 2014; Berazneva and Lee, 2013).

Between December 2010 and March 2011, unprecedented mass revolts erupted in the Middle East and North Africa (MENA) region, commonly known as the Arab Spring, resulting in the toppling of the political regimes in Tunisia, Egypt, Libya and Yemen (Salih, 2013). In media and policy discourses, these uprisings have always been portrayed as politically motivated revolts against longstanding dictatorial regimes" (Abu Hatab, 2014; Lynch, 2013). From a literature perspective, investigating the root causes, processes and outcomes of the Arab Spring has been the subject of voluminous research literatures, with the majority being in the fields of political science, international relations, and media studies, and focusing mainly on questions related to social mobilization, democratization and political change (Heydemann, 2016; Tudoroiu, 2014; Stepan and Linz, 2013; Horst, et al., 2016). However, the role of food prices in the emergence of the Arab Spring has received comparatively less scholarly attention, despite several studies have pointed out that it coincided with a period of volatile global food prices, which is potentially important given that the MENA region is characterized by heavy reliance on food imports and increasing rates of food insecurity and poverty (Soffiantini, 2014).

Upon a closer examination of the economic literature on the "food-unrest" nexus in developing countries in general and in the MENA region in particular, two obvious limitations become apparent. First, the vast majority of extant analyses used highly aggregated data and looked at developing countries and/or the MENA countries as a single region (e.g.: Maystadt et al., 2014; Malik and Awadallah, 2013). In this regard, Ianchovichina et al. (2014) point out that the economic literature provides little empirical evidence on the effect of (global) food price shocks on domestic food prices in individual MENA countries. This is potentially problematic given the heterogeneity nature of the MENA region with member countries ranging from high-income resource-rich countries (e.g. Gulf countries) to middle-and lower-middle income countries in North Africa (e.g. Egypt and Tunisia) and least-developed countries (e.g. Yemen and Sudan). Furthermore, it ignores the fact that the role and importance of agrifood sectors in MENA economies vary considerably, while they, for instance, represent around 27% of the GDP in Sudan and less than 1% in of the GDP of Kuwait and Bahrain (Fritzsche and Ruettinger, 2013). In addition, MENA countries differ markedly in terms of their political and socioeconomic structures, agronomic systems, consumption patterns and food diets, and the shares of food in consumer's basket. Thus, neglecting the various country-specific factors and channels (e.g. food controls and subsidies; trade liberalization policies; and domestic supply chain organization and management), through which global food prices affect domestic prices and subsequently cause social unrest, naturally precludes the possibility of analyzing these issues from a deeper perspective and makes any generalization of results from regional-level analyses questionable. Second, and in connection with the previous characteristic of this literature, existing studies overlook the "spatial" dimension and the fact that the impact of rising food prices can differ across households in different geographic regions within a country. In this respect, Smith (2014) illustrates that some household groups may benefit from rising food prices, whereas others may be adversely affected. That is, higher food prices could theoretically lead to income gains for net food producers in rural communities. In contrast, the urban poor as well as the rural poor, who are net food consumers, are likely to suffer from food price rises. In this context, Ivanic et al. (2012) note that although the direct welfare effects of high food prices might be most severe among the rural poor, food-related unrest has traditionally been an urban and middle-class phenomenon. Thus, when studying the potential effect of food prices on social unrest it is important to understand how these shocks affect consumers in different spatial locations, especially in areas where people

rely more on own production and on markets for food, and how these effects may influence prospective social unrest.

Against this background, this study aims to address these two gaps in the literature by using country-level monthly panel dataset to investigate how decreased access to food, due to food price shocks, may result in social unrest. More specifically, the study uses a unique monthly panel dataset from Egypt to examine empirically the role that food prices played in the emergence of social unrest in various geographic regions of the country between January 1998 and December 2013. The study contributes to the existing literature in two important ways. First, the use of monthly food price and social unrest data allows us to capture short-term (i.e., month-to-month) food price fluctuations and their consequences on social unrest. As noted by Bellemare (2015), capturing short-term effects of food price shocks is quite important since the likelihood that people would react to short-term effects of food price movements is much higher than it is for long-term changes (i.e., annual). Second, the period (1998-2013) covered by the empirical analysis in this study had witnessed the end of the "cheap food era" in early 2000s, the global food crisis in 2007-2008, the global financial crisis in 2008-2009 and the Arab Spring movement in 2011. Thus, the results of our paper provide empirical insights that take into consideration the likely effects of these food crises and shocks on the likelihood of social unrest to emerge. Moreover, by identifying potential pathways by which food prices may result in social unrest, we seek to advance the theory of food riot mobilization to develop deeper understanding of how food riots mobilize and how best to address them.

2. Theoretical background and review of the literature

Traditionally, research has examined the relationship between food prices and unrest by operationalizing food security in multiple ways to measure the determinants an individual's ability to adequately access food (Sen, 1981). In measuring this relationship, researchers often relay on measures of food supply, food price, price volatility and poverty and food insecurity indicators. For instance, Arezki and Bruckner (2011) and Lagi et al. (2011) use the price of food to measure food price fluctuations and show that increases in global food prices are positively associated with increases in social unrest and conflict. In the same vein, Smith (2014) and Raleigh et al. (2015) find that spikes in domestic and local prices are associated with increased probability of unrest. Another category in this literature focused in the potential role of food price volatility rather than exclusively price levels in the emergence of social unrest (e.g. Bellemare, 2015; Weinberg & Bakker, 2015). However, the findings of these studies were less consistent, with some showing that global food price volatility had no effect on social unrest (Bellemare, 2015; Leblang and William, 2011), and others showing that food price volatility had a significant impact on social unrest (Weinberg & Bakker, 2015). A third category in this literature used levels of poverty and domestic food production to operationalize food access, showing that higher levels of poverty and decreased food production per capita are correlated with a higher likelihood of food riots (e.g. Berazneva & Lee, 2013).

Despite that the literature provides inconclusive evidence regarding the way that food access influences social unrest, there is a relative consensus that the price of food correlates positively with the occurrence of social unrest. However, the fact that rising food prices do not lead to equally distributed social unrest between and within developing countries implies that other additional factors should be taken into consideration to strengthen the understanding of the spatial and temporal variation in the occurrence of social unrest. In this regard, Abu Hatab and Maher (2020) note that two questions remain incompletely answered regarding the emergence of the Arab Spring in 2011: (i) why did the Egyptian uprisings occurred in 2011, and not any time earlier given that the political regimes had already been rolling for decades?, and (ii) why did they took place in some Arab countries and not in the others?

In this respect, Bush & Martiniello (2017) note that social unrest often is ostensibly about high food prices, but such disturbances remain part of a broader political unrest with state oppression and austerity. Similarly, Harrigan (2014) point out that food price inflation was the final nail in the coffin for the Egyptian political system that was failing to deliver on their side of the social contract, implying the existence of other contextual factors across countries that determine social unrest. In this regard, the literature reveals that higher international food prices are associated with increased likelihood of social unrest (Arezki & Brukner, 2011). Previous country-level studies show also that social unrest has a strong territorial dimension, while dwellers of urban regions in developing countries are more likely to engage in social unrest events (Cohen & Garrett, 2010; Hendrix & Haggard, 2015). Other studies show reveal that sociopolitical factors including political freedom, corruption, and unemployment are important determinants of social unrest (e.g. Berazneva & Lee, 2013). Legwegoh et al. (2015) analyzed locations of social unrest to determine sociopolitical conditions at the

household level that link increasing food prices to the likelihood of participation in riots, and concluded that food price was a determining factor in motivating social unrest, and that contextual factors, including employment, education and political satisfaction, determined who participated and what was demanded. Furthermore, the literature increasingly recognizes the role of physical environmental changes in in determining the occurrence of social unrest in developing countries, particularly in densely populated and ecologically sensitive areas. For instance, Kaniewski et al. (2020) find that climate and socioeconomic factors coevally have always been major contributing factors to social unrest in the Eastern Mediterranean and Near-Middle East countries. Bellemare (2014) show that natural disasters and extreme events constitute shocks to food supply and demand and can identify the causal relationship between food prices and social unrest.

Previous studies have also compared and investigated the "political" and "food" related motivations behind social unrest in developing countries. A strand in this literature shows that food price shocks play a central role in the occurrence of social unrest, as suggested by the cited literature in previous paragraphs. Another strand in the literature, however, suggests that social unrest is certainly political in nature, yet the grievances and demands are food unrelated. In this regard, Amin (2012) argues that food prices played no role in the emergence of social unrest in 2008 in Cameroon, which was primarily protests against the president's proposal to remove presidential term limits. Likewise, Demarest (2015) provides similar findings from Guinea and Senegal, while people's demands during social unrest events had little to do with food prices or access.

Based on this brief review of the literature, which highlights the seeming contradiction between the findings of previous studies, how can the relationship between food prices and social unrest be understood? In response to this question, researchers including Demarest (2015) and Heslin (2020) emphasize the need for increased theorizing of food-related unrest, particularly using disaggregated data and micro-level evidence to investigate the mechanisms by which food prices influence the emergence of social unrest. We endeavor to contribute to that understanding by examining the ways through which social unrest emerges in conditions of decreased access to food and food insecurity.

3. Case selection: Egypt as a case for the study of the food-unrest nexus

Egypt is well suited as a case for the study of the interlinkages between food prices and social unrest due to a set of agronomic, demographic and socioeconomic characteristics that make the impact of food price shocks on social unrest especially visible. From an agronomic system's perspective, natural-resource constraints present multiple challenges to a sustainable increase of food production. Water resources in Egypt are scarce, and arable land is limited and suffers from continuous degradation due to water and wind erosion and unsustainable farming practices (Hereher, 2013). Moreover, the country loses nearly 60.000 acres of fertile agricultural land annually due to rapid urban sprawl and soil erosion (Gohar and Ward, 2010). Furthermore, Egypt is one of the 'most-at-risk' countries regarding the effects of climate change, while low-lying areas in the Nile Delta and coast, where around 40% of Egypt's agricultural production takes place, are susceptible to sea-level rise (Baderldin et al., 2019). Demographically, Egypt is the most populous country in the MENA region with a total population estimated at around 95 million in 2017 (CAPMAS, 2017). Population is growing rapidly at around 2% annually, compared to an average growth rate of 1.5% in other developing countries (ibid). Poverty is widespread in the country, while around 60% of the population is either poor or vulnerable, and inequality is on the rise (World Bank, 2019). Moreover, the national poverty rate grew from around 19.6% in 2004 to around 30% in 2015 (ibid). In addition to these challenges, food consumption is among the highest rates in the MENA region; while annual per capita consumption of wheat- for example- is around 200 kilograms, three times higher than the world average (CAPMAS, 2017). Therefore, Egypt has traditionally been relying heavily on food imports (Tellioglu and Konandreas, 2017), which recently amounted to about 45% of domestic food demand in 2017 (CAPMAS, 2017). Specially, food self-sufficiency ratios for major food commodity groups are as low as 58% for cereals; 26% for vegetable oils, 35% for oil crops; and, 73% for sugar crops (ibid). Such heavy reliance on global food markets leaves Egypt greatly vulnerable to fluctuations in commodity food markets and food price shocks (Abu Hatab, 2016). Furthermore, the large shares of food commodities in the consumption basket of many households in MENA countries (around 45% household income share spend on food in Egypt) implies that the purchasing power of poor households would decline sharply in response to food price inflation (Walsh, 2011). This can subsequently lead to enduring effects on headline inflation through inflationary expectations and workers' demands for higher wages. Under such conditions, food price shocks are likely to serve as a catalyst factor that unites and mobilizes aggrieved subpopulations against the rolling regime and causes social unrest (Barrett, 2013). As mentioned in the previous section, we recognize that social unrest has more than a single root cause; but the aim of the empirical analysis in this study is to investigate the relative importance of food price changes with respect to the reaction

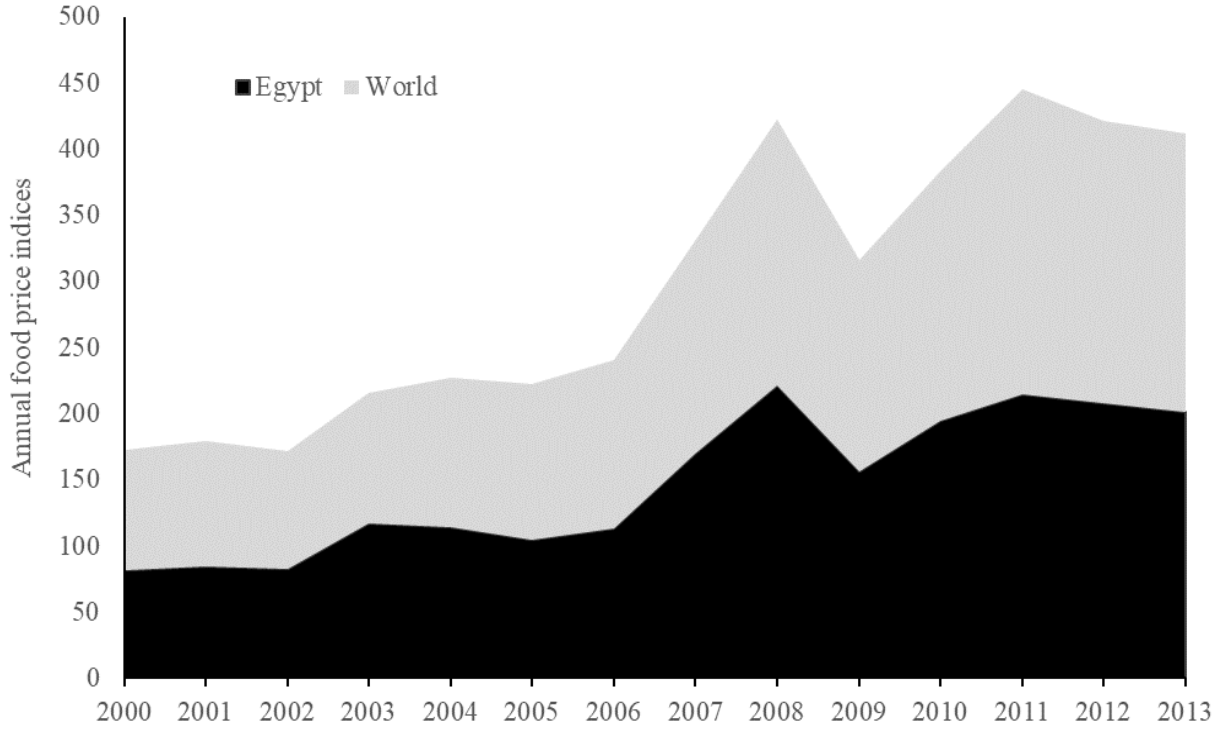
of the Egyptians reflected by the emergence of social unrest. Being able to quantify this can enable political decision makers to better predict what underlying role food prices have for political stability.

4. Overview of food price policies and social unrest in Egypt since 1950s

An Egyptian proverb states "feed the mouth, the eye becomes bashful". Inherently, maintaining affordable food prices through subsidies and other measures has since 1950s been a key strategy that the political system in Egypt has always been using to avoid sociopolitical instability (Ramadan and Thomas, 2011). Until 1970s, this strategy had succeeded to a great deal in achieving its goal of providing cheap food commodities and avoiding the consequences of food prices inflation. Since the mid-1970s, this strategy has become a major burden on the government's budget due to the continuous expansion in the food subsidy program in terms of both the coverage and the number of subsidized commodities. A series of attempts had been made during the 1970s to reform the food subsidy program; however, government interventions resulted in waves of large-scale violent social unrest (the so-called January 1971 food riots) and led to their alteration. Since then, successive governments seem to have been reminded that any major reforms in food price polices could result in similar sociopolitical disturbance. Therefore, the food price subsidy system in Egypt continued to expand during the 1980s so that the majority of Egyptians held subsidized ration cards (Löfgren and El-Said, 2001).

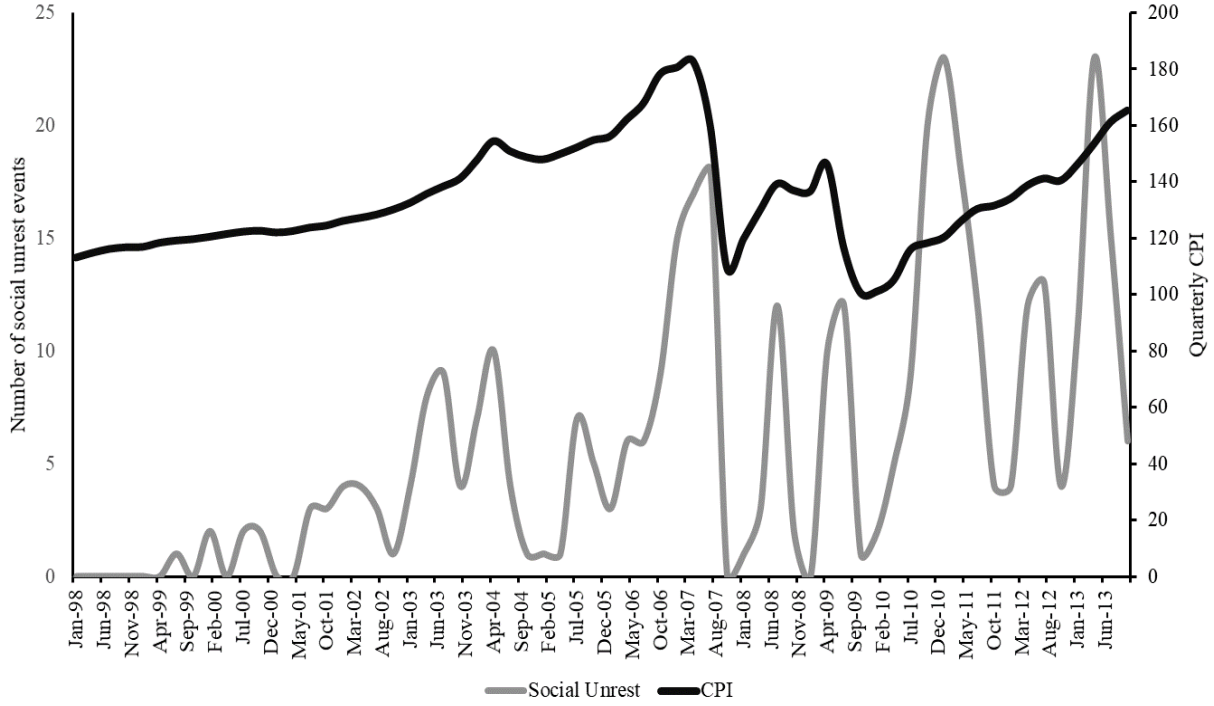
Under increasing budget deficit and foreign debt obligations during the 1990s, the government spending on food subsidies, which calculated for around 21.5% of total public expenditure, became fiscally unsustainable. To address this issue, successive Egyptian governments adopted several food subsidy reform policies during the 1990s and 2000s, which involved a slow transformation process and indirect interventions (e.g. reducing the number of subsidized food commodities and their weights, and changing the recipe of some commodities) to avoid negative political repercussions and social tension. These efforts had significantly decreased the percentage of the beneficiaries of the subsidy program from around 99% in 1981 to 70% in 2000, and considerably shrank the share of food subsidy in total public expenditure to around 6% in 2000 and to 4% in 2007 (Youssef 2008). However, the emergence of the food crisis in 2008 as well as the global food crisis between 2008 and 2010 resulted in sharp increases in global food commodity prices (Figure 1). Specially, international prices of all food commodity groups rose substantially during 2007-2008, and even though they plunged somewhat in 2009, prices recovered rapidly in 2010.

Figure 1. World versus Egypt's annual food price index (2002-2004=100)



Source: FAOSTAT (2019) and CAPMAS (2017).

Figure 2. Quarterly food price index and social unrest in Egypt, 1998-2013



Source: CPI data were obtained from CAPMAS (2017) and social unrest data were compiled by the authors (see the *data* section).

Expectedly, global food price shocks translated to high domestic food prices and exposed many segments of Egypt's population to sharp inflationary pressures. For instance, cereal prices increased by around 130% between 2007 and 2008, leading to an increase in the production cost of bread by around 50% (WFP, 2008). Moreover, between 2008 and 2010, rice prices rose by 83%, vegetables prices by 88%, cooking-oil prices by 300%, and overall foodstuff by 24% in 2010 (CAPMAS, 2012). In juxtaposition, food-related riots sparked across the country and the government had to put a halt to its reform programs and increase spending on food subsidies. As a result, the cost of food subsidy almost doubled between 2007 and 2010, climbing from USD 2.3 billion to around USD 5 billion. Specially, the bread subsidy reached USD 2.7 billion in 2008, exceeding government spending on health and education (CAPMAS, 2010). Nevertheless, increasing government spending on food subsidy did not succeed this time in buffering the effects of food price shocks. Therefore, the number and magnitude of protests and food-related riots, as shown in Figure 2, increased and became more frequent across the country between 2007 and 2010/11. In particular, the data portrayed in Figure 2 suggest that the highest levels of the domestic food price index moved hand-in-hand with the two peaks of food-related unrest in the country during the period 2007-2011, implying that a correlation existed between domestic food price volatility and social unrest in Egypt during the period understudy. These food riots seem to have paved the way for a steady revolutionary movement against the ruling government across the country, which led finally to the ouster of the political regime in 2011.

5. Conceptual framework and model

We hypothesize that the occurrence of a social unrest (Y) in an Egyptian region r in any month t under investigation can be modeled as a function of macroeconomic control variables such as food prices (P), food imports (M) but also variables that approximate the political discourse in Egypt around food prices and political unrest, as approximated by i=1,…, N discursive frames (F) in Egyptian media. In addition, we control for the average monthly temperature (C) and an overall time trend (T). The conceptual model is represented by equation 1:

$$y_{r,t} = f(P_{r,t}, M_t, C_{r,t}.F_{i,t}, T_t) \quad (1)$$

Conducting a discourse analysis based on media reports can be useful within applied economic research, if this way hypotheses can be tested that are otherwise, e.g. with conventional surveys, hard to test. For instance, surveys may not be feasible because a relevant group of respondents cannot be reached for interviews and secondary data about prices, etc. might be in a specific case uninformative.

We follow the approach of Hess et al. (2012) that utilizes the framework of discourse analysis as a specific type of survey: For a given policy topic it is assumed that over time 'the media' (e.g. the journalists) keep reporting the opinions of whom they consider to be among the most relevant stakeholders for a specific policy topic. Of course, different journalists from different newspapers may have diverging views on who are the most relevant stakeholders, and which statements issued by these stakeholders should occur in a newspaper article. Thus, the media coverage of a topic can be understood as a qualitative, permanently ongoing, unbalanced and potentially biased survey of stakeholder opinions. Clearly, such information has to be handled with care within empirical analyses. However, utilizing such information may be in some cases the only feasible way to obtain a comprehensive panel of stakeholder opinions over a longer period. This approach adopts the discourse concept by Foucault (1991) which assumes that discourses themselves function as institution-like mechanisms that construct and shape a society. Indeed, it is hard to identify any verbal element issued in speech or writing that would not be somehow part of the overall discourse. Furthermore, any such verbal element can be understood as a "text", and such texts are understood as always drawing upon and transforming other prior texts, no matter how distant in time these prior texts have occurred. A common method of empirical media-based discourse analysis is "frame analysis". A frame is a set of statements that point towards a certain policy solution or an interpretative pattern. Since media frames can influence policy, actors will compete for the power to frame policy issues in the mass media in correspondence with their own particular interests. Following Hess et al. (2012) we employ the following definitions:

The discourse (D) on food prices in Egypt is made up of the frames relevant to a certain topic or policy issue. A frame (Fi, with i=1, 2,…, I; I≥1) is a set of statements Rij that represent a collectively shared interpretative pattern of this issue. An example of a frame is: F1 – "The government should act about the high food prices". A statement (Rij, with j=1, 2,…, J; J≥0) is the smallest unit of information within the discourse. There are J statements that address Fi, and an example of a statement R1,1 that addresses F1 is: "If the government does not lower food prices soon, my family will not be able to eat sufficiently any more". Statements are made by actors (Aq, with q = 1, 2,…, Q; Q≥1) such as individual consumers, farmers, politicians, members of the administration, and journalists.

6. Data and variables

6.1. Data collection on media frames

We obtained data on actual food-related unrest events and counts of media articles that address certain frames through a comprehensive search of the digital archives of two leading Egyptian newspapers, namely; '*Al-Ahram'* and '*Al-Masry Al-Youm'*. The selection of these two newspapers followed a threefold rationale. First, by relaying on a state-owned newspaper (*Al-Ahram*) and a private independent newspaper (*Al-Masry Al-Youm*), we aimed at controlling for "media bias", i.e., the potential bias of news producers in the selection of events and stories to be reported regarding food-related riots. Second, we selected these two newspapers based on their circulation, reputation and quality of journalism and readership. That is, Al-Masry Al-Youm and Al-Ahram were ranked as first and third, respectively, in terms of content coverage of Egyptian newspapers (IDSC, 2011). Third, the chosen newspapers have freely accessible online and offline archives for each single issue published during the study period.

Our archives' search considered the daily issues of the two newspaper from January 1st, 1998, when the earliest digital issue of the newspapers is available online, to December 31st, 2013, when the Egyptian Protest Act (Act 107/2013) was promulgated and signed into law in the end of 2013 (November 24th, 2013). This law has widely restricted civil political demonstrations in the country: it criminalizes and sets heavy prison sentences for organizers of demonstrations and public meetings of more than 10 people who fail to seek security permissions for their protests, and it effectively grants security officials discretion to forcibly disperse any protest on very vague and unclear grounds (HRW, 2013). Thus, the total number of protests across the country diminished by around 73% between December 2013 and June 2014 and have further declined sharply since then.

With regard to the archival search process, we first adopted a snowball approach to search the recent literature on food prices and social unrest in developing countries with the aim to develop a matrix of the most relevant keywords used in this literature. Next, a focus-group discussion involving a selected group of experienced researchers from food and agricultural research institutes, journalists and media representatives, farmers' organizations, non-governmental community development organizations and other key stakeholders was organized in Cairo, Egypt in June 2014 to validate the pre-identified keywords and to ensure that the most

effective keywords would be used in searching the digital archives of the two selected newspapers. Examples of the keywords included in the final list of keywords include: "demonstration"; "strike"; "set-in"; "protest"; "food boycotts"; "food disturbances"; "food protests"; "hunger riots"; and "rioting over food". A full list of the final keywords (in Arabic) used in the archival search of the two newspapers can be obtained from the corresponding author upon request. Following the identification of search keywords, the research team recruited four research assistants to search the daily issues of each of the two newspapers during the period from January 1998 to December 2013.

6.2. The dependent variable

The Dependent Variable 'Social Unrest': Across the literature, there is no unique definition for the "social unrest". According to Hensman (1969), social unrest is "the rapid social change and the rapid mobilization of new groups into politics, coupled with the slow development of political institutions" that leads directly to political disorder. In this study, we regard "social unrest" as any collective action that reflects public dissatisfaction (e.g. riots, demonstrations, strikes) and disrupts the typical social order of a local community within Egypt. The dependent variable was coded as a binary variable that takes the value 1 if there is one or more incidents of social unrest within a region in a single month reported in two daily newspapers, and 0 otherwise. That is, an unrest event was coded and included in our dataset if (i) the event was reported in the two newspapers to eliminate the probability of media bias, (ii) the topic was related to social unrest and at least one of the identified keywords, and (iii) the event took place in any of the eight administrative regions of Egypt.

Table 1. Predefined frames in newspaper articles

No.	Original frame	Sub-topics included in frame
F1	Bread-related frames	Shortage of bread, low quality of bread
F2	Illegal practices of consumers or producers	Black market for food, subsidized bread as fodder
F3	Natural disasters	Effect of climate events on food prices
F4	High cost of production and marketing	Cost of fertilizer, irrigation, transportation, postharvest
F4	Government interventions are positive (usually stated by politicians)	Increase of cultivated areas, productivity increase, subsidy measures led to price decline
F5	Domestic food price inflation	Increase in domestic food prices was topic of the article itself
F6	Government measures should be adopted to cope with food price volatility	Rethink subsidy levels, minimum wages, fight monopolies, reduce income taxes
F7	International prices affect domestic ones	Global food price volatility, exchange rate, high maritime transport cost
F8	Inefficient production & marketing policies	Reduction of purchasing prices for farmers, inefficient credit policies
F9	Access to public goods and services	e.g. Poor medical and educational services
F10	Agricultural inputs lacking	Agr. Production practices need support
F11	Workers' situation & public assets liquidation	Work conditions, wages, health insurance, privatization since the 1990s lead to unfair labor practices
F12	Basic human and civil rights	Human rights, pollution, unfair elections, freedom of speech
F13	Public institutions related	Corruption, conflicts with administration
F14	Unemployment	Job losses

While the candidate unrest events were extracted from the newspapers' archives by four different members of the research team, a second screening process was implemented where another member of the research team was asked to re-screen the results that had been extracted by other team members. For those newspaper articles where disagreement occurred between the research assistants, discussions between the two who were involved in coding were used to reach an agreement. Finally, we developed a coding scheme to extract information

about each identified unrest event. This coding scheme provided detailed information regarding each social unrest event including: a unique ID for each event, the date of publication, the author's name, the identity of the protesters, the type/form of the event, the city/region where the event took place, the three major demands of the protesters, and, where available, the duration and the total number of people who participated in the event.

6.3. The independent variables

The selection of the independent variables was based on the theoretical background and the review of literature presented earlier in this paper. To capture the effect of spikes in domestic food prices on the probability of unrest to occur, we used monthly consumer price indices (CPIs) for food and non-alcoholic beverages for each region during the period of study, which were obtained from the monthly CPI bulletins of the Central Agency for Public Mobility and Statistics (CAPMAS)[1] in Egypt. In these bulletins, data on a representative basket of relevant foodstuffs are collected and reported on a monthly basis. With such monthly data, we are able to capture immediate pressure resulting from short-term changes in food prices as felt by local consumers in each region. Unemployment ratio and real GDP per capita were included as measures socioeconomic conditions and the standard of living in different regions. The data were compiled from the corresponding bulletins and the yearbooks of CAPMAS during the period 1998-2013. Furthermore, we introduced a dummy variable "*urban*", which takes the value 1 if the region is classified by CAPMAS as urban, and zero otherwise, to capture the potential effect of food price shocks on consumers in different spatial locations, and their subsequent impact on social unrest. The temperature data were obtained from the archives of the Central Laboratory for Agricultural Climate at the Egyptian Ministry of Agriculture and Land Reclamation.

Given that Egypt is a net importer of food and that the literature shows that global food prices could positively influence social unrest and conflict in developing countries (e.g. Arezki and Bruckner, 2011; Lagi et al., 2011), we included the FAO monthly CPI index to capture the "pass-through" effect of international food commodity prices on the likelihood of social unrest as well as to compare the influence of global *versus* domestic food prices on domestic social unrest. The data were obtained from FAOSTAT monthly consumer price indices database[2].

Finally, discursive frames have been collected as counts of media articles as long as both newspapers provided articles with statements that can be attributed to the following frames (see Table 1). Compiling these variables yielded a dataset of the main variables of interest for 8 administrative regions and 60 months between January 1998 and December 2013. Table 2 provides descriptive statistics of the explanatory variables used in the estimation of the Fixed-Effects Logit Panel model.

Table 2. Descriptive Statistics of the explanatory variables

Variable	Operational definition	Obs	Mean	Std. Dev.	Min	Max
P	CPI of food and non-alc. beverages	480	130.45	24.91	94.60	195.50
FAO	FAO monthly food CPI index	480	189.05	31.68	134.75	240.09
Unemploy	% of unemployed people	480	10.78	02.46	04.94	15.51
Realgdp	Real GDP in EGP	480	621.24	84.93	446.90	782.98
Urban	Region characteristics (urban/non-urban)	480	0.72	0.45	0	1.00
C	Maximum temperature (Celsius)	480	22.74	5.64	11.02	34.60
F1	Count of Bread-related frames (Count)	480	0.70	2.04	0	11.00
F4	Government interventions positive (Count)	480	9.38	9.211	0	42.00
F6	Gov. measures should be adopted (Count)	480	6.65	6.34	0	27.00
F7	International food price inflation (Count)	480	16.08	14.89	0	79.00
F11	Workers' situation (Count)	480	4.68	9.01	0	58.00
F13	Public institutions related (Count)	480	4.467	6.63	0	41.00

7. Results and discussion

Table 3 presents the estimates of the model in equation (1) explaining the determinants of social unrest in Egypt during the period 1998-2013, which was econometrically estimated as a binary Fixed-Effects Logit

[1] See, https://www.capmas.gov.eg/
[2]See, http://www.fao.org/faostat/en/#data/CP/

Panel model using Maximum Likelihood. Initially, all available frames in Table 1 have been tested within the model; however, only the statistically most significant variables have been retained. Positive coefficients indicate a positive effect on the probability that an unrest would occur, and vice versa. The explanatory power of the model in terms of overall share of cases correctly predicted amounts to 71.2%, and a McFadden R-Squared of 0.306.

In light of the above, the following findings could be established. First, our results indicate that an increase in the CPI of food and nonalcoholic beverages in the average region of Egypt had a positive and statistically highly significant effect on the probability to observe a media report about an unrest in that region. Likewise, the results show that changes in global food prices, measured by the FAO food price index, were positively associated with an increased likelihood of social unrest. These findings are broadly consistent with those indicating that spikes in both domestic food prices (e.g. Smith, 2014; Raleigh et al., 2015) as well as global food prices (Bellemare, 2015; Weinberg & Bakker, 2015) increase the probability of social unrest to occur. On the one hand, these findings are expected given Egypt's heavy reliance on global food markets to meet the food demands of its population.

On the other hand, these findings highlight the inefficiency of the food subsidy program, which despite being an important pillar in the social safety net (Aboulenein et al., 2010), has failed to absorb the effects of global food prices' volatility and ensure stable food access to the population. In this regard, Pinstrup-Andersen (2016) point out that the food subsidy system in Egypt suffers from increasing inefficiencies associated with corruption, waste, and lack of right targeting. Moreover, Ramadan and Hosni (2018) illustrate that piecemeal reforms implemented by successive governments in Egypt remain incomplete and insufficient to tackle the roots of the system inefficiency. In this regard, Lagi et al. (2011) and Soffiantini (2020) indicate that the precipitating condition for the Arab Spring in Egypt was the failure the State's food subsidy program to ensure food security and achieving social justice by correcting market failures and protecting low and middle-class consumers from the impact of global food prices during turbulent times during the last few decades.

Table 3. Estimation results Fixed-Effects Logit Panel model with Clustered Robust Standard Errors

Variable	Coef.	Std.Err.	z	P>|z|
P	0.055	0.008	7.260	0.000
FAO	0.018	0.006	3.250	0.001
Unemploy	-0.017	0.105	-0.160	0.873
Realgdp	-0.006	0.003	-1.780	0.076
Urban	0.889	0.502	1.770	0.047
C	0.082	0.024	3.490	0.000
F1	-0.211	0.116	-1.830	0.068
F4	0.063	0.023	2.690	0.007
F6	-0.151	0.036	-4.170	0.000
F7	0.022	0.011	2.010	0.044
F11	-0.044	0.028	-1.550	0.121
F13	0.121	0.041	2.930	0.003
T	0.008	0.017	0.470	0.064
Log-likelihood		-200.351		
McFadden R-Squared		0.306		
McFadden's Adjusted R2		0.261		
Share of cases correctly predicted		71,2%		

Second, the results show that an increase in per capita real GDP decreases the probability of social unrest, despite that the relationship is statistically significant only at 10% level of significance. This finding comports with those of MacCulloch (2004) and MacCulloch and Pezzini (2010) showing that the higher the level of a region's economic development and thus GDP per capita, the lower the risks of a civil conflict and the weaker the support for revolutionary ideas among the population. The weak statistical significance of the coefficient

might be explained by the fact that GDP per capita and social unrest is not characterized by a straightforward negative correlation; it rather has an inverted U-shape (Korotayev et al., 2018). It should be highlighted that some other studies have found positive relationship between GDP per capita growth and the emergence of social unrest, which were explained by the classic theory of modernization (Lipset, 1959) hypothesizing that economic development makes, citizens are increasingly less ready to tolerate repressive regimes (Epstein et al., 2006; Boix, 2011).

Third, the results unexpectedly reveal that the rate of unemployment has a statistically insignificant negative effect on the emergence of social unrest. A possible explanation of this finding is that our variable measures the overall unemployment in the studied regions and does not consider the differences in unemployment ratios among different population and age groups. In this regard, LaGraffe (2012) argues that the large "youth bulge" in Egypt played a major role in the Arab Spring, while the inability of youth to access the opportunities promised in the social contract of adulthood, including viable employment, has led to massive resentment motivating youth to actively seek change within their country and region (Mulderig, 2013). Moreover, Abu Hatab (2016) points out that youth unemployment, not overall unemployment, was a major chronic challenge to the Egyptian government during the last decade of Mubarak regime, while the majority of the unemployed in Egypt are educated young people. However, it should be highlighted that existing research provides an inconclusive evidence on the relationship between unemployment and the Arab Spring (Paasonen, 2020). On the one hand, traditionally been seen as a factor that considerably increases the likelihood of various forms of political instability including the Arab Spring and other uprisings in developing countries (e.g. Cramer, 2011, Ottaway and Hamzawy, 2011, Paasonen, 2020). On the other hand, several studies find little evidence that unrest correlated with unemployment. For instance, Byun and Hollander (2015) find that unemployment had insignificant impact on the level of unrest in the Arab Spring countries. Likewise, Doherty and Schraeder (2015) find that there were statistically insignificant differences between the unemployed and the employed as to how often they took part in protests before the ousting of the Tunisian regime in 2011. In addition, Beissinger et al. (2012) and Hoffman and Jamal (2014) investigated the determinants of protest participation in Tunisia and Egypt and found that unemployment was a statistically insignificant predictor of participation in the Arab Spring insurgencies in either country.

Fourth, the maximum temperature in the average region and month have a statistically significant effect on the probability that media would report about social unrest. Given the significant time trend variable that has also been included in the regression, the effect of temperature is unlikely due to overall time effects. Instead, it can be concluded that higher temperatures put pressures on the local population as well as the capacity of local agrifood production systems by increasing demand for irrigation water and increasing crop losses. Therefore, it is plausible that regional temperature peaks contributed to the probability of social unrest. This finding is in conformity with the findings of (Kahl, 2006), Maxwell et al. (2010) and Raleigh et al. (2014), implying that both long and short deviations from the climatic mean can lead to social unrest and violent conflicts, especially in developing countries, by reducing the availability of land and water resources, reducing food production and yields, and increasing food price volatility.

Fifth, our results lend support to the hypothesis that social unrest in developing countries has a strong "spatial" dimension (Smith, 2014 and Ivanic et al., 2012), where the coefficient of the "Urban" variable was found to have a statistically positive influence on social unrest. In this context, Barrett (2013) illustrates that social unrest is overwhelmingly an "urban phenomenon", which often involve middle class and wealthier citizens over the more vulnerable rural poor. In the same vein, Rudolfsen (2020) points out that urban population has a greater capacity to engage in collective action than rural population, since urban dwellers are more reliant on the market for food, and they are further away from its production. In addition, (poor) rural households often have limited collective action mechanisms and are less likely to participate in protests, despite that they could be more affected by food prices shocks than certain segments of the urban population (Raleigh et al., 2015).

Sixth, in relation to the discourse around food prices and citizens' dissatisfaction with the government, Table 3 shows that the frames on bread-related topics (*F1*) and work conditions (*F11*) show a statistically very weak correlation with the probability of an unrest event to occur. Frames not included in the regression model in Table 3 showed even weaker statistical significance. However, the frame related to international price increases (*F7*) is statistically significant. This means that a higher number of media reports on international food price increases are statistically related to a higher probability of an unrest to occur. The frame that stresses the positive effects of governmental measures to combat food price inflation (*F7*) in Egypt is highly statistically significant. This frame has been primarily addressed by politicians and members of the public administration in Egypt. Apparently, attempts to assuage the public anger about food price inflation have not achieved their

intended outcomes and have been on average ineffective in preventing unrest. In addition, the results reveal that a higher number of media reports on policy measures that could and should be adopted (*F6*), for instance higher minimum wages and a higher food subsidy, had a statistically significant and negative effect on the probability of unrest to occur. Likewise, the more media reported on issues related to the inefficiency of the government institutions (*F13*) including corruption, lack of transparency and discoordination and lack of harmony and clarity between state agencies, the significantly higher the likelihood of social unrest to occur. Ostensibly, Egyptians did not agree with the measures proposed by their governmental officials, or did not trust anymore that the government would successfully adopt and implement the necessary policies and interventions. When assessing the magnitude of the estimated coefficients, it turns out that the strongest statistically significant coefficient has not been estimated for international food price increases and food price inflation itself, but for protests related to the quality of public institutions.

8. Concluding remarks

In summary, our findings suggest that the probability of social unrest to occur in the average Egyptian region during the period under consideration is related to the levels of domestic and global food prices. Socioeconomic characteristics, proxied by the real GDP per capita, and the spatial characteristics of the regions are significant predictors of social unrest. In addition, rising temperature is associated with an increased likelihood of social unrest through its effects on food production and yields, and price volatility in domestic food markets. The findings indicate also that the likelihood of social unrest is related to the frequency of media reports about food price increases and potential measures that the government should adopt in order to deal with them. However, in the light of the overall discourse, we found that the food price related media frames, despite being statistically significant and positively related to social unrest, have lower estimated coefficients than the media frame that captures the frequency of reports on the low quality of Egyptian institutions in general, namely corruption and conflicts. Thus, our analysis, which provide an in-depth understanding of the relationship between food prices and social unrest during a historically crucial time span in Egypt, does not rule out that global food price spikes and food price volatility contributed to the occurrence of social unrest in Egypt. However, the analysis also suggests that food prices were neither the only nor the most important factor that triggered the Arab Spring Revolution. Instead, the general level of dissatisfaction with Egyptian institutions likely had an even more pronounced effect on social unrest. It is up to future research to determine if the institutional dissatisfaction alone would have been sufficient to induce the Arab spring revolution, or if high food prices can be viewed as a necessary condition that had to be present in order to create the required momentum.

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