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Determinants of Arab Spring: An Empirical Investigation

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Abstract

What were the structural determinants of the recent Arab Spring protests that originated from Tunisia and Egypt and soon engulfed the MENA region? We have used a static FE model and a dynamic GMM model, on a panel data of 14 MENA countries for the period 2006-2017, to examine the socio-economic and political determinants of both nonviolent and violent Arab Spring protests. We find strong empirical support, from both FE and GMM models, that political factors are the main determinants of Arab spring events. For the economic factors we find empirical support only from our dynamic GMM model, but not FE model. We do not find any empirical support for socio-demographic factors contributing to Arab spring from either of models. Regarding economic factor, our GMM model support the view that deteriorations in standards of living has led to protests. our findings suggest that increases in CPI led to violent protests, while countries with high levels of HDI witnessed more nonviolent protests. Moreover, our findings suggest that improvements in GDP per capita, higher government public expenditure on areas like health sector might lead to fewer nonviolent and violent protests. Regarding political factors, results from FE model show that higher 'Polity score' leads to more nonviolent and violent protests. From GMM model we also find that greater access to political rights might have contributed to more nonviolent and violent protests. Our findings regarding political variables are in line with 'intermediate/transitional regimes' hypothesis which postulate that regimes with intermediate levels of democratization are more prone to destabilization than the consolidated authoritarian or democratic regimes. Moreover, our findings suggest that improvements in civil liberties and more nuanced dimensions of democratic processes in a society leads to less number of protests.

JEL Classification: D74

Keywords: Arab Spring, Democratization, MENA countries, Protests, , GMM, GDELT.

1. Introduction

In December 2010, a wave of protests and uprisings, popularly referred as 'Arab Spring', spread through out the MENA counties. It first started in Tunisia after Mohamed Bouazizi, an unemployed 26-year-old Tunisian citizen, protested government corruption by setting fire to himself on December 17 2010. Soon the protests and uprisings spread to other countries of the region like Egypt Libya, Syria, Bahrain and Yemen. In Tunisia it resulted in a change of regime on 14 January 2011. After Tunisia the wave of uprisings reached Egypt resulting in stepping down of Hosni Mubarak from the post of President – a post which he held for nearly thirty years. Soon the protests spread to Libya, which led to civil war and subsequent international military intervention and toppling of Qaddafi's rule. Similarly, soon Syria witnessed uprisings, but the government resorted to brutal repressions, leading to a deadly civil war with more than 560,000 deaths (Syrian Observatory for Human Rights, 2018) , with over 5.6 million people fleeing Syria, and 6.6 million people being internally displaced, which accounts for more than half of the population of the country (UNHCR, 2018). The fifth country to witness the wave of protests were Bahrain. But the Bahrain monarchy, by some policy concessions and a military intervention by Gulf Cooperation Council (GCC) countries, managed to sustain its rule. Similarly, on February, 2011, more than a hundred thousand people protested across Yemen too. However, President Saleh, in a political settlement facilitated by Saudi Arabia and (GCC), signed the transition deal and agreed to step down for a transitional government. Apart from above cases of Arab spring, no serious uprising or revolution happened in other countries of the region like Saudi Arabia, Qatar, Jordan, Algeria and Iran. Hence, the first natural question that might arise is what are the factors which caused a revolution in some countries but not in others.

It is not so obvious from the socio-economic conditions of the MENA region whether it was socio-economic distresses which caused Arab Spring events or was it a desire for more the political rights and civil liberties. In the 2000s, many developing countries in MENA did well in terms of poverty statistics and human development indicators. The region had notable achievements in terms of Millennium Development Goals related to poverty, access to infrastructure services, sanitation, internet connectivity, reducing hunger, child and maternal mortality, and increasing school enrollment (Iqbal and Kindrebeogo, 2015). Similarly the incomes of the bottom 40% grew at higher rates than average expenditures, and the Gini inequality indices were low by international standards and did not worsen in most MENA economies (Ianchovichina et al., 2015). Also with regards to stability indices most developing MENA countries were seen as relatively stable in the decade prior to Arab spring.

Libya and Tunisia, two of the Arab spring countries, appeared among the stronger and less fragile countries in the world, ranking 111th and 118th out of 177 countries, respectively, (Goodwin, 2011).

These apparently opposing relationship between socio-economic conditions in the decade before Arab spring and the onset of Arab spring protests calls for a deeper and more careful empirical study of various socio-economic, political and demographic conditions in MENA region prior to Arab spring events. The purpose of this paper is to empirically investigate these structural factors in the light of existing theories and explanations of social instability and revolutions. Regan and Norton (2005), Costello et al (2015) and Witte et al (2019) treat non-violent and violent protests differently, arguing that their determinants are different and they could affect political outcomes differently. In light of this, we will be investigating the structural determinants of non-violent and violent protests separately. In this paper we would be accounting for more nuanced measures of democratic processes in a society like level of constraints on chief executives of a country, degree of regimes' repressiveness, degree of civil liberties, and also socio-economic conditions prevailing in a country, which would result in a deeperswx and more comprehensive understanding of the structural determinants of the Arab Spring events.

Section 2 of the paper will give a brief survey of both theoretical and empirical literature. Section 3 gives some descriptive statistics of Arab spring protests. Section 4 would describe the methodology and estimation strategy. Section 5 discusses the results and finding of the study. And section 6 will give the conclusion and summary of the paper.

2. A Survey of Literature

2.1. Theoretical literature

Thee is a wide range of theoretical literature on the topic of democratization, starting from the disciplines of political science and sociology to the more recent attention of economic discipline to democratization and regime changes. The broad focus of these theories is on how and under what conditions the countries will democratize. Democratization theory includes the structural theories like that of 'modernization theory' (Lipset, 1959; Barro, 1999) which postulates democracy as a natural consequence of economic development. The other main classic works that scholars use to understand the rise of dictatorial regimes in the 1960s and 1970s includes three classics of direct relevance to the "Transitions collection": Schmitter (1974), O'donnell (1973), and Linz and Stepan (1978). However, Linz and Stepan's approach is not structural but part of 'pacted-transition' literature which emphasizes the behavior and choices of elites as important determinant of democratization.

Failure of modernization theory (Lipset, 1959) in explaining lack of democratization in the MENA region, has led to development of alternative theories. In literature factors like rentier state and oil wealth (Beblawi, 1987; Ross, 2001; Smith, 2004), religion and Arab culture (Hudson, 1995; Kedourie, 1994; Kramer, 1993; Tessler, 2002; Platteau, 2011; Pryor, 2007), and MENA region's colonial legacy and regional conflict (Waterbury, 1994; Brynen, 2004; Henry & Springborg, 2001) have been postulated as the main roadblock to democratization in the MENA region. Other strand of studies points out to the post-independence 'social contract' of MENA region, also referred to as 'authoritarian bargain', which trades authoritarian rule with high redistributions and patronages (Hinnebusch, R., 2019; Rougier, E., 2016; Brumberg, 1990; Desai, Olofsgå rd, & Yousef, 2014; Noland & Pack, 2007; Richards & Waterbury, 1990). It is discussed that the oversized and coercive state apparatus have certainly hampered structural transformation by discouraging private sector modernization (Bellin, 2004; Henry & Springborg, 2001; Heydemann, 2004; Owen, 2013). Similarly, partial liberalization reforms in the 1980-90s did not produce a positive broad-based effect benefiting everyone; but rather had strengthened cronyism, resulting in the economies that are strongly adverse to innovative behavior (Cammett and Diwan, 2013; Malik & Awadallah, 2013).

The other line of study relevant for protests activity is the studies on general 'instability factors' in a society. A considerable number of studies have analyzed the various instability events that have taken place in different countries at different times and pointed to common destabilizing factors among them. Korotayev et al. (2014) list two categories of objective and subjective factors as the instability factors common to the countries of Arab spring type. He lists objective factors of instability as: a) Political preconditions- type of political order(transitional regimes in case of MENA); presence of intra-elite conflict; inefficient power transfer tools; b) Social preconditions—the presence of internal social, religious, ethnic, and tribal conflicts; c)Demographic factor or the presence of "combustible material-presence of a "youth bulge," youth unemployment; d) External factors- the presence of a significant destabilizing/stabilizing external factor that influences the development of a situation in the country; e) Historical background—the presence of large-scale conflicts that led to the burnout of "combustible material" in the near past; and f) Islamist factor—presence/absence of the legal basis for the functioning of the Islamist-oriented opposition. Similarly he lists the subjective factors of instability as: a) Crisis of unfulfilled expectations of modernization; and b) Presence of an attractive (though perhaps imaginary) alternative to the existing regime. Moreover, some studies on 'subjective-wellbeing' also postulate that the perceived idea of personal hardship increases the likelihood of uprisings (Deaton et al., 2009; Radcliff, 2001; Veenhoven, 2000; Diener and Biswas-Diener, 2002; Easterlin, 1974; Oswald, 1997). Witte et. al. (2019) empirically indicate that subjective measures of well-being were important in determining the level of grievances in MENA region prior to Arab spring.

2.2. Empirical Literature on the 'Instability factors' common to Arab spring countries

In the empirical studies of Arab spring events different socio-economic, political, demographic and geographical elements are counted as the factors of instability common to MENA region. The main explanations for the of Arab spring come under the broad categories of socio-economic distress and dissatisfaction with standards of living, 'autocratic bargain' and limited political rights, and lack on civil liberties and social freedoms. AS Arampatzi et al. (2018) point out, by the end of the 2000s, the erosion in standards of living was felt not only by the poor but middle class too. A gradual shift in government support to the elites became a particular concern (Cammett and Diwan, 2013). One of the factors affecting standards of living was high dependence on imported food and increases in the global commodity prices combined with limited fiscal space (Korotayev and Zikina, 2011; Ianchovichina et al., 2012). The other main economic factor pointed out is unemployment and Low Quality Jobs, especially for educated youth, due to the growing informality of the private sector (Arampatzi et al. 2018; Campante and Chor, 2012). Crony Capitalism and 'Wasta' is discussed to be the other factor responsible for dissatisfaction and grievances in MENA region. A true open market and a politically-indiscriminate capitalism were not developed in MENA countries. Private sector growth was stifled by 'cronyism'. Similarly it is discussed that prior reforms of the 1990s were implemented in an uneven way benefiting mainly the elites (Chekir and Diwan, 2014; Rijkers et al., 2014) who dominated a range of economic sectors (Malik and Awadallah, 2013).

Similarly the idea of 'unhappy development paradox' (Graham and Lora, 2009; Deaton, 2008; Stevenson and Wolfers, 2008) is being related to Arab spring events too, which also relates to the subject well-being literature. Witte et al (2019) empirically find that a decrease in subjective well-being measures leads to an increase in nonviolent uprisings: a one-percentage point increase in suffering increases nonviolent conflict events by 2.1%. The magnitude of this effect is similar to that of a percentage point decrease in GDP growth. Similarly, Arampatzi et al. (2018) conduct a pool survey and find support for the view that changes in MENA social contract has weakened the direct link between authoritarianism (e.g. lack of freedom) and life satisfaction. Their empirical findings show that: dissatisfaction with standards of living, bad job market conditions, lack of quality jobs, dissatisfaction with the educational system, perceptions of inequality of opportunities (or 'wasta'), corruption and crony capitalism, are the main factors with the largest negative effect on life satisfaction in developing MENA countries. These findings are in line with another poll held by Zogby in 2005, in MENA, in which respondents indicated that the lack of employment opportunities, corruption, healthcare and schooling were seen as the most pertinent problems in developing MENA

countries (Zogby, 2005).

In this part we discuss our choices of different socio-economic and political variables, as determinants of the Arab spring events, which is motivated from the survey of existing literature. Once could expect that increases in the following economic variables should lead to more grievances and, hence, high number of protests in a country. Following variables are expected to have a positive relationship with the level of protests, and it is believed that they might have contributed to Arab spring protests: 1) Unemployment (Campante and Chor, 2012; Singerman (2013); Arampatzi et al, 2018); 2) Spikes in food prices and CPI (Korotayev and Zinkina, 2011; Breisinger et al, 2011; Chenoweth & Ulfelder, 2017) (3) Food imports: Countries like Egypt are highly dependent on food imports, and the global commodity price increases of the 2000s would transmit to domestic markets despite the presence of food subsidies (Korotayev and Zikina, 2011; Ianchovichina et al., 2012; Arampatzi et al, 2018).

On the other hand, one could expect that improvements in the following economic variables should lead to less grievances and, hence, low number of protests in a country. So a negative relationship between these variables and the level of protests is expected. 1) Subsidies and public spending (Bellin, 2004; Bromley, 2014; Cammett and Diwan, 2013) 2) Oil-rents : in the context of 'authoritarian bargain' of MENA region, oil-rents might give a government more cooptative resources to buy-off legitimacy and also more coercive resources to repress and control dissent, which should lead to less protests. (Yom and Gause, 2012; Costello et al, 2015). 3) Domestic food production: One possibility could be that, with high price of imported food, due global food crisis, some countries might shift to domestically produced food items and could spare an inflation in the price of food consumption.

However, the effect of some other variables on the protest levels is not so obvious. For instance, one cannot expect an obvious relationship between following variables and the number of protests. 1) GDP per capita: in the literature the opinion is mixed regarding the relationship between GDP per capita growth and levels, and level of conflict and possibility of democratization. Miguel et al (2004), MacCulloch (2004), MacCulloch and Pezzini (2010), Parvin (1973) and Weede (1981) show that there is a negative relationship between GDP per capita growth and level, and degree destabilization and conflict in a society. While, some other research, related to Lipset (1959) modernization theory, claim that in certain conditions, economic development can rather increase sociopolitical instability (Goldstone, 2014; Huntington, 1968; Olson, 1963). Korotayev et al (2018) empirically show that there is an inverted U-shape relationship between GDP per capita level and level of protests. So one cannot expect an exact positive or negative relationship between GDP per capita growth, and also level of GDP per captia, and the number of protests in a country. We need to test it empirically to see the results. 2) Human Development Index (HDI): similarly the exact relationship between HDI levels and

number of protests cannot exactly be anticipated. On the one hand underdevelopment could cause grievances and should lead to more protests. But, on the other hand, the act of political awareness and participating in societal collective actions itself might necessitate some prior high levels of HDI, e.g. education, on the part of individual. Hence, it is difficult to predict either a positive or negative relationship between HDI levels and levels of protests.

Similarly, the political variables used in this paper are also motivated by the existing literature. These variables are: Political rights, from Freedom House Index; 'Polity score', from Polity IV dataset (Democracy score minus Authoritarian score); and Political Terror Scale (PTS), indicating regime's repressiveness. Similarly, we use three other component variables used in Polity IV dataset for calculating democracy scores. These variables are xrcomp (Executive recruitment competitiveness); xropen (Executive recruitment openness); exconst (Constraint on top executives). These variables give a more comprehensive and in-depth picture about the level of democracy in a country, than the mere 'Polity score' variable.

In addition, the relationship between some political variables and number of protest activities in a country is not very clear. Consider, for example, the political rights variable: It is possible that lack of political rights and freedoms cause grievances among the citizens and hence lead to protests and uprisings. On the other hand, more political freedom can also provide more opportunities for citizens to raise their voices and express their discontent regarding some policies of the regimes; and hence, lead to more protests in a country. Same argument also applies to the case of 'regime repressiveness': By using repressive measure a regime could, to some extent, inhibit and control the possibility of large protests and big political gatherings. But, at the same time, resorting to repressive measures by the regime might lead to more violent reactions from the protesters side and might lead to more intense and frequent protests. So the effect of political variables on protests might not be so obvious as in the case of economic variables.

Similarly, the socio-demographic variables used in this paper are as follows: 1) Mobile use: The social media and mobile use can be very effective in organizing and managing of social gatherings and also in broadcasting the protest news. Aouragh and Alexander (2011), Lim (2012) have documented the extensive use of the internet, mobile cell phones, and social media in Egypt during the Kafaya movement (2004– 05) and again during the 2010–11 Arab spring protests. So a positive relationship between mobile use and number of protest activity should be expected. 2) Civil liberties: Another important social factor for grievances and protests might be the extent civil and other social freedoms are allowed in a society. Some of the regimes in MENA region are religiously conservative and might impose restrictions on some of the civil and social liberties. So one plausible anticipation would be that less civil liberties should increase probability of more protests i.e. there should be a negative

relation between them. 3) Youth unemployment: According to UNICEF (2019), MENA region's Children and young people (0-24 year) currently account for nearly half of the region's population, and, as of 2018, youth unemployment (15-24 years) in the region, with estimated 29.3 per cent of adolescents and youth in North Africa and 22.2 per cent in the Arab states, is currently the highest in the world. Similarly, Campante and Chor (2012) and Singerman (2013) link the Arab spring uprisings to youth bulge, especially, when intertwined with other economic variables like unemployment. Here, instead of youth bulge, we will use variable 'Youth unemployment' rate. Since it is not youth bulge per se, but coupled with other factors like unemployment, which might result in grievances and protests. In other words, we explore whether a higher rate of youth unemployment leads to higher grievances and, hence, more protests.

3. **Datasets and Variables**

The dataset used in this empirical study consists of 14 MENA countries for the period 2006-2017, including the four Arab spring countries of Tunisia, Egypt, Libya and Syria which experienced either a regime change or a civil war as a result of those events. The countries included in the dataset are: Algeria, Bahrain, Egypt, Arab Rep., Jordan, Kuwait, Libya, Morocco, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Tunisia, United Arab Emirates and Yemen. Countries like Palestine and Lebanon were not included in the sample due to their unique historical record of conflicts with Israel. Similarly, Iraq was not included in the sample because of its recent invasion by the American forces in 2003.

Dependent variable:

We use the 'Global Dataset on Events, Location, and Tone' (GDELT) dataset which records nearly a quarter-billion political events that has occurred across the world since 1979. Acemoglu, et al (2018), and, Levin and Crandall (2018) are among the studies that have used the GDELT dataset to study of Arab spring events. GDELT is a machine-coded events dataset that codes political events, including protests and riots, from publicly available news reports. Each GDELT row records a primary actor, the primary actor's action (the event), and the actor receiving the action. News sources for GDELTS event data includes international, regional and local news sources. Events and actors in GDELT dataset is coded using the 'Conflict and Mediation Event Observations (CAMEO) coding system. GDELT codes 20 main categories of events. We would be using the data from 'Protest' category (Event code (14)) which is defined as per CAMEO coding system in a three- level taxonomy. The protest category is further divided into sub-categories in the column 'eventbasecode' which classifies protests into codes: 140 (engage in political dissent, not specified otherwise), 141 (Demonstrate or rally), 142 (conduct

hunger strike), 143 (conduct strike or boycott), 144 (obstruct passage, block), and 145 (protest violently, riot). Furthermore, from above categorization, we construct two broad categories of protests i.e. Non-violent protest and Violent protests. Non-violent protests is the sum total of number of protests in all other categories in column 'eventbasecode', except the category 145 (protest violently, riot) which comes under violent protests category. Further, As the GDELT protests data are at the day level and other economic and political explanatory variables are at the level of the year, we have aggregated the number of protest events at the level of year too. So our dependent variable is the number of Nonviolent and Violent demonstration in a country-year. For a full description of each category and their division into subcategories, see the codebook for the Conflict and Mediation Event Observations (CAMEO) dataset (Gerner, Schrodt, Abu-Jabr & Yilmaz 2002).

Table 1 below, gives a description of all the acronyms for the variables used in this paper, along with their data sources.

Table 1. Variables and Data-sources

Variables	**Variable name and Measurement**	**Source**
Gdelt_Dem_NonVoil	Number of nonviolent protests in a country-year	'Global Dataset on Events, Location, and Tone' (GDELT) dataset
Gdelt_Dem_Voil	Number of violent protests in a country-year	'Global Dataset on Events, Location, and Tone' (GDELT) dataset
logGDPpc	Log of GDP per capita	(World Bank)
GDPpcg	GDP per capita growth rate	(World Bank)
CPI	Consumer Price Index (2010=100)	(World Bank)
HDI	Human Development Index (Index value)	Organistation for Islamic Cooperation (IOC)
Domgovhealthexp	Domestic government health expenditure (% of GDP)	(World Bank)
Foodprodu	Food Production Index (2004-2006 = 100)	(World Bank)

Foodimports	Food imports (% of merchandise imports)	(World Bank)
Mobile	Mobile cellular subscriptions (per 100 people)	(World Bank)
Oil_Rents	Oil rents (% of GDP)	(World Bank)
Unemp_total	Total Unemployment (% of total labor force) (modeled ILO estimate)	(World Bank)
Unemp_Youth	Youth Unemployment (% of total labor force, age 15-24) (modeled ILO estimate)	(World Bank)
PR1	Converted Political Rights index (1 = least free & 7 = most free) (In original dataset, 1 = most free & 7 = least free)	(Freedom House dataset)
CL1	Converted Civil Liberties Index (1 = least free & 7 = most free). (In original dataset, 1 = most free & 7 = least free).	(Freedom House dataset)
PTS_S	Political Terror Scale: US State Department	Political-Terror Scale dataset
polityIV	Polity Score: subtraction of autocracy score of a country from its democracy score (ranges from -10 to +10)	PolityIV dataset
xrcomp	Executive recruitment competitiveness variable	PolityIV dataset
xropen	Executive recruitment openness variable	PolityIV dataset
exconst	Constraint on top executives of a country	PolityIV dataset

4. Some Descriptive statistics

Table 2 provides the descriptive statistics for both dependent and independent variables used in the empirical models. There are two dependent variables, Gdelt_Dem_NonViol and Gdelt_Dem_Viol, used in two separate models. The remaining variables are explanatory variables.

Table 2. Descriptive statistics of variables

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	Standard deviation	Minimum value	Maximum value
Gdelt_Dem_NonVoil	168	60.96	178.9	0	1,393
Gdelt_Dem_Voil	168	1.655	4.432	0	28
logGDPpc	168	9.032	1.262	6.540	11.19
GDPpcg	168	-0.0925	12.14	-62.23	123.0
CPI	155	105.6	20.15	62.17	231.1
HDI	168	0.730	0.102	0.450	0.860
Domgovhealthexp	133	2.523	1.112	0.609	6.374
Foodprodu	154	121.7	27.82	64.26	203.3
Foodimports	136	14.92	6.637	4.744	46.93
Mobile	165	112.8	43.75	14.07	214.7
Oil_Rents	140	20.26	18.11	0.000852	62.43
Unemp_total	168	8.674	5.817	0.122	19.43
Unemp_Youth	168	21.98	12.77	0.405	45.94
PR1	168	2.179	1.144	1	7
CL1	168	2.726	0.914	1	5
PTS_S	168	2.845	1.067	1	5
polityIV	168	-5	4.384	-10	7
xrcomp	153	0.824	0.446	0	2
xropen	153	1.621	1.293	0	4
exconst	153	2.575	1.321	1	6

To have a clear picture of the Arab Spring events and the number of both non-violent and violent demonstrations in different MENA countries, it would be helpful to present some figures and graphs of the demonstrations in different countries. This is done in figure 1-4 below.

Figure 1. Demonstrations for MENA countries, individual trends:

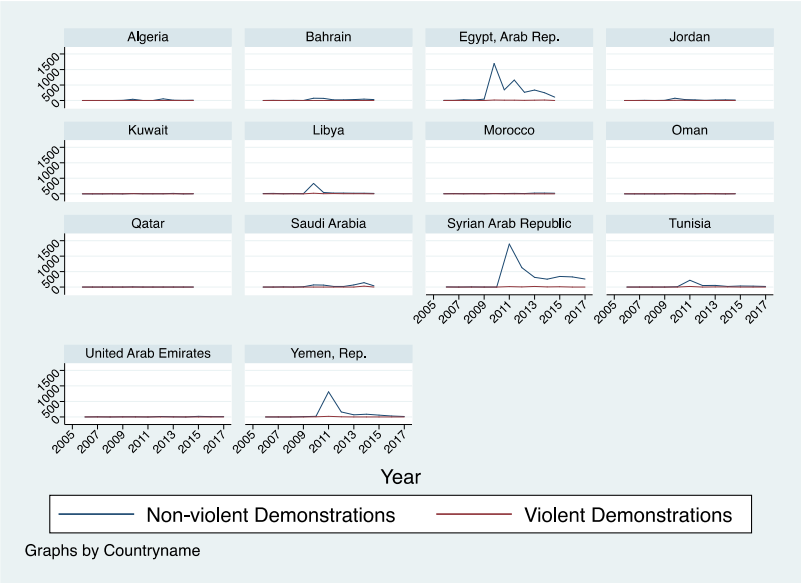


Figure 2. Non-violent Demonstrations

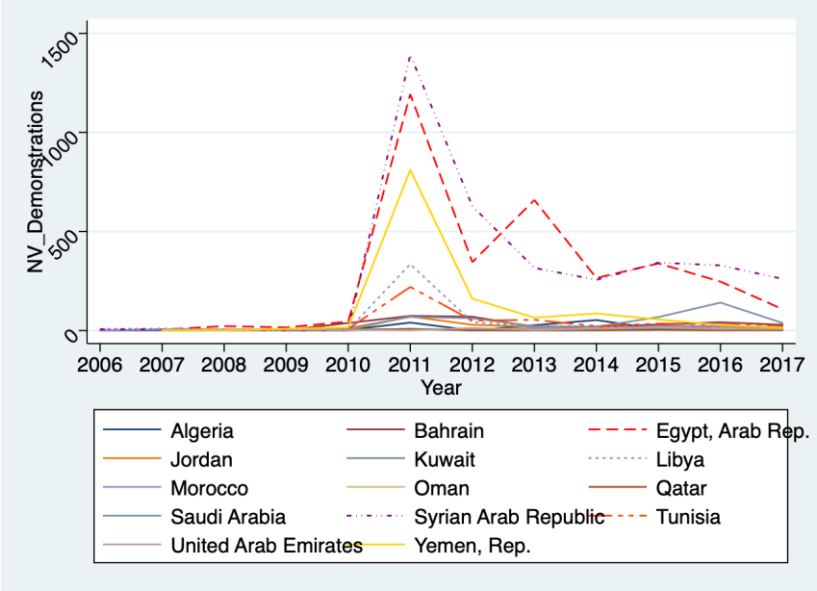


Figure 3. Violent Demonstrations

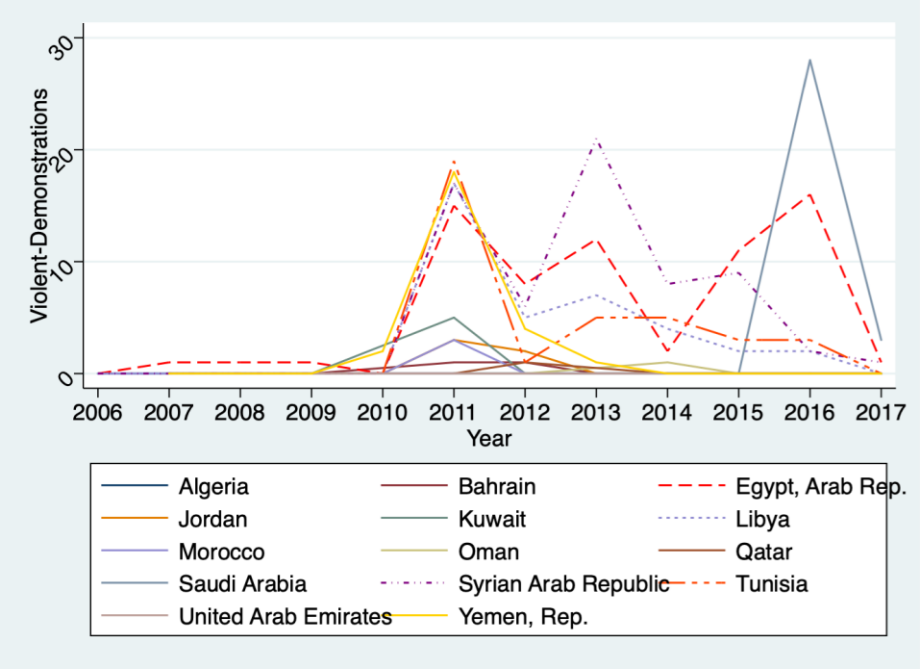
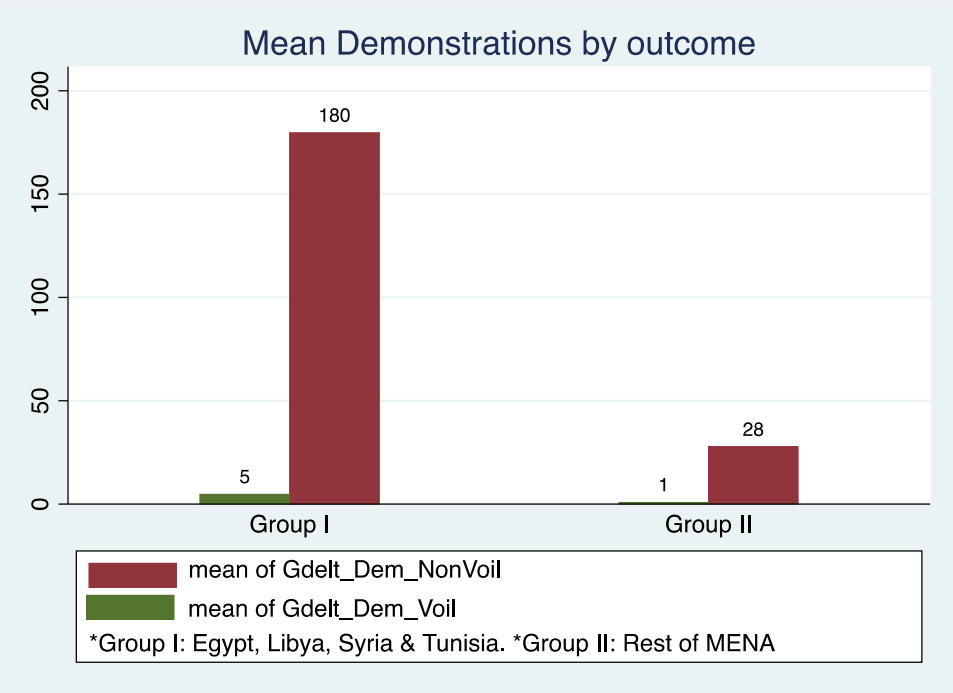


Figure 4. Mean demonstrations by outcome



5. Estimation strategy and specifications of the Models

Firstly, we use a static econometric model to test for the determinants of the both Nonviolent and Violent Demonstrations. We follow this with a dynamic GMM model to capture the dynamic and intertemporal dimensions of protests as well. We will run both the static and the dynamic models for two dependent variables, namely Non-violent and Violent protests, and then compare the final results from both models to see whether the dynamic models could give us better results than static model in explaining the socio-economic and political determinants of the Arab Spring Uprisings.

The regression equations for static model is as follows:

$$\begin{aligned}(Dem_{NonViol} = \beta_0 + \beta_1 logGDPpc + \beta_2 GDPpcg + \beta_3 CPI + \beta_4 HDI + \beta_5 Domgovhealthexp \\ + \beta_6 Foodprodu + \beta_7 FoodImport + \beta_8 Mobile + \beta_9 Oil_{Rents} + +\beta_{10} Unemp_{total} \\ + \beta_{11} Unemp_{Youth} + \beta_{12} PR1 + \beta_{13} CL1 + \beta_{14} PTS_S + \beta_{15} polityIV + \beta_{16} xrcomp \\ + \beta_{17} xropen + \beta_{18} exconst) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (1)\end{aligned}$$

$$\begin{aligned}(Dem_{Viol} = \beta_0 + \beta_1 logGDPpc + \beta_2 GDPpcg + \beta_3 CPI + \beta_4 HDI + \beta_5 Domgovhealthexp \\ + \beta_6 Foodprodu + \beta_7 FoodImport + \beta_8 Mobile + \beta_9 Oil_{Rents} + +\beta_{10} Unemp_{total} \\ + \beta_{11} Unemp_{Youth} + \beta_{12} PR1 + \beta_{13} CL1 + \beta_{14} PTS_S + \beta_{15} polityIV + \beta_{16} xrcomp \\ + \beta_{17} xropen + \beta_{18} exconst) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.\ldots.. (2)\end{aligned}$$

The regression equations for the dynamic model are as follows:

$$\begin{aligned}\big(Dem_{NonViol} = \beta_0 + \delta Dem_{NonViol_{t-1}} + \beta_0 + \beta_1 logGDPpc + \beta_2 GDPpcg + \beta_3 CPI + \beta_4 HDI \\ + \beta_5 Domgovhealthexp + \beta_6 Foodprodu + \beta_7 FoodImport + \beta_8 Mobile \\ + \beta_9 Oil_{Rents} + +\beta_{10} Unemp_{total} + \beta_{11} Unemp_{Youth} + \beta_{12} PR1 + \beta_{13} CL1 \\ + \beta_{14} PTS_S + \beta_{15} polityIV + \beta_{16} xrcomp + \beta_{17} xropen \\ + \beta_{18} exconst\big) \ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (3)\end{aligned}$$

$$\begin{aligned}\big(Dem_{Viol} = \beta_0 + \delta Dem_{Viol_{t-1}} + \beta_0 + \beta_1 logGDPpc + \beta_2 GDPpcg + \beta_3 CPI + \beta_4 HDI \\ + \beta_5 Domgovhealthexp + \beta_6 Foodprodu + \beta_7 FoodImport + \beta_8 Mobile \\ + \beta_9 Oil_{Rents} + +\beta_{10} Unemp_{total} + \beta_{11} Unemp_{Youth} + \beta_{12} PR1 + \beta_{13} CL1 \\ + \beta_{14} PTS_S + \beta_{15} polityIV + \beta_{16} xrcomp + \beta_{17} xropen \\ + \beta_{18} exconst\big) \ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (4)\end{aligned}$$

Choosing the appropriate static model:
I would be running all the tests for two dependent variables i.e. non-violent and violent protests. All the tables reporting the results of the preliminary tests are included in the. In order to choose

between Random Effects and the pooled OLS model, we run a Breusch-Pagan Lagrange multiplier (LM) test. This test will examine whether there is presence of the panel effect in the data or not. The Null hypothesis is that there is no panel effect present in the data, i.e. the variance across entities is zero, which implies that the pooled-OLS is the appropriate model. If we can statistically reject the Null, then we choose the RE model. Table 3 below reports the results for this test and shows that the p-value for all the four models (i.e. both non-violent and violent models, with and without time dummies) are equal to 1, which means we are not able to reject the Null hypothesis (at 1% significance level) . Hence, the pooled-OLS is more appropriate model to use, than the RE model.

Table. 3 Choosing between RE and pooled-OLS:

Results from Breusch-Pagan Lagrange multiplier (LM) test

Null hypothesis: pooled-OLS is appropriate model

Alternative hypothesis: RE model is appropriate

Estimated results:

Dem_NonViol (without time dummies):

Breusch and Pagan Lagrangian multiplier test for random effects:

	Variance	Standard deviation
Gde~nVoil	23705.58	153.9662
e	6162.134	78.49926
u	0	0

Test: Var(u) = 0

chibar2(01) = 0.00

Prob > chibar2 = 1.0000

Dem_Viol (without time dummies):

Breusch and Pagan Lagrangian multiplier test for random effects

	Variance	Standard deviation
Gde~_Voil	7.789491	2.790966
e	3.351766	1.830783
u	0	0

Test: Var(u) = 0

chibar2(01) = 0.00

Prob > chibar2 = 1.0000

Dem_NonViol (with time dummies):		
Breusch and Pagan Lagrangian multiplier test for random effects		
	Variance	Standard deviation
Gde~nVoil	23705.58	153.9662
e	5523.657	74.32131
u	0	0
Test: Var(u) = 0 chibar2(01) = 0.00 Prob > chibar2 = 1.0000		

Dem_Viol (with time dummies):		
Breusch and Pagan Lagrangian multiplier test for random effects		
	Variance	Standard deviation
Gde~_Voil	7.789491	2.790966
e	2.893131	1.700921
u	0	0
Test: Var(u) = 0 chibar2(01) = 0.00 Prob > chibar2 = 1.0000		

Next we choose between pooled-OLS and fixed effects model. To do so one has to test whether the country dummies are jointly statistically different from zero or not. The Null hypothesis for this test is that the country fixed effects (i.e. country dummies) are equal to zero. Rejecting the Null implies that the country fixed effects are significant and we should choose the FE model. The results from the table 4 below show that we can reject the Null hypothesis with very high statistical significance, which implies that a FE model is the appropriate model to use rather than a pooled-OLS model.

Table 4. Choosing between Pooled OLS vs FE model

Testing the statistical significance of individual country dummies			
Null hypothesis: Country-Dummies not important (equal to zero) i.e. Pooled-OLS is appropriate. **Alternative hypothesis:** FE model is appropriate			
Dem_NonViol (without time dummies)	Dem_NonViol(with time dummies)	Dem_Viol(without time dummies)	Dem_Viol (with time dummies)
F(11, 78) = 10.81 Prob > F = 0.0000	F(11, 69) = 8.34 Prob > F = 0.0000	F(11, 78) = 3.89 Prob > F = 0.0002	F(11, 69) = 2.39 Prob > F = 0.0141

As we saw from above results, among the Pooled-OLS, Random effects and FE model, the FE model was the appropriate model. For the sake of robustness we also run a direct test between FE and RE models too. But before that, we test for presence of Heteroskedasticity in the data, and also

significance of the time dummies. For heteroskedasticity test, Table 5 below shows we are able to reject the Null hypothesis of 'no heteroskedasticity' in the data. In the presence of heteroskedasticity, the usual standard errors will be biased and we cannot use a standard Hausman test. Hence, we use the Mundlak (1978) test where the standard errors are robust to heteroskedasticity.

Table 5. Reporting results of Heteroskedasticity tests

Modified Wald test for groupwise heteroskedasticity in fixed effect regression model			
Null hypothesis: Homoskedasity Alternative hypothesis: Heteroskedasticity			
Dem_NonVoil (without year dummies)	Dem_NonVoil (with year dummies)	Dem_Voil (without year dummies)	Dem_Voil (with year dummies)
chi2 (14) = 5647.32 Prob>chi2 = 0.0000	chi2 (14) = 634.48 Prob>chi2 = 0.0000	chi2 (14) = 610.23 Prob>chi2 = 0.0000	chi2 (14) = 292.00 Prob>chi2 = 0.0000

Similarly, we test whether the Year dummies are jointly significant, and different from zero, or not. The Null hypothesis is that time dummies are jointly equal to zero. Table 6 below shows that we can reject the Null at less than 5% significance level, and so the year dummies are jointly significant and we should include them in the Mudlak test that follows.

Table 6. Reporting results of year dummies' significance test

Results for year dummies' significance test	
H0: Year dummies are jointly equal to zero and not statistically significant to be included in the model) Stata command used: testparm i.year	
Dem_NonVoil	Dem_Voil
F(9, 13) = 2.96 Prob > F = 0.0374	F(9, 13) = 3.07 Prob > F = 0.0329

Now we come back to Mundlak (1978) test in choosing between FE and RE models. The Null for the Mundlak test is that there is no correlation between the time-invariant unobservables and the model's regressors, implying the random-effects model is appropriate. If we can reject the null, then the FE model is the appropriate model to use. Results from Table 7 below show that we are able to reject the

Null hypothesis with very high statistical significance level and, hence, FE model is the appropriate model to use in the presence of heteroskedasticity and time dummies.

Table 7. Reporting results of Mundlak test

Results from Mundlak test for Choosing between FE and RE model	
H0: RE is appropriate H1: FE is appropriate	
Dem_NonVoil	**Dem_Voil**
chi2(11) = 8573.11 Prob > chi2 = 0.0000	chi2(11) = 1045.14 Prob > chi2 = 0.0000

The GMM models

For the dynamic equation, including the lagged dependent variable in the regression equation causes the problem of endogeneity, as the first lag of dependent variable in the list of explanatory variable is correlated with the current error term which cannot be tackled with the static regression models like OLS, FE or RE. A GMM model tackles endogeneity issue by instrumenting the lagged dependent variable with its further lagged values, as the second and further lags of dependent variable is not correlated with the current error term. Additionally, the GMM model by design can take care of problems of measurement error and omitted variable bias, along with endogeneity problem. We follow Arellano and Bover (1995) and Blundell and Bond (1998), and present both one-step and two-step system GMM estimates for both nonviolent and violent protests. The Arellano and Bover (1995) and Blundell and Bond (1998) estimates, under the mild stationarity assumption, circumvent the finite sample bias which is present under difference GMM of Arellano and Bond (1991). However, the asymptotic efficiency gains of the system GMM estimator comes with the cost that the number of instruments will be increasing exponentially with the number of time periods. This leads to finite sample bias, increases the likelihood of false positive results, and might lead to suspiciously high pass rates for the specification tests like the Hansen (1982) J-test (see Roodman, 2009b). To tackle the issue of instrument proliferation, we follow Roodman (2009b) and present results with a collapsed

instrument matrix, and also use only second lags, for both of our models. We also use Windmeijer (2005) finite sample corrected standard errors.[1]

6. Results and Analysis

After the number of tests we did in section 5, the empirical results showed that a FE model with robust standard errors and time dummies is the final appropriate static model to use on our dataset. Table 8 below reports the estimates from our FE model, and it shows that among economic variable only oil rents is negative and significant in determining both nonviolent and violent protests. This implies that countries with higher oil-rents have experienced less number of protests which might be due to the abundance of financial resources in their disposal to buy political legitimacy against the provision of public services. This supports the so called 'authoritarian bargain' in case of MENA region. However, our static model does not show any statistical significance for other important economic variables such as GDP per capita level, GDP per capita growth, inflation, HDI, total and youth unemployment rate, food imports and higher cellphone use, which are posited in the literature as important determinants of the Arab spring. So our static model does not support the economic variables as the main determinant of both non-violent and violent protests.

With respect to political factors the picture is quite different. Our static model results indicate that most of political variables are statistically significant in explaining both non-violent and violent protests. Table 8 below shows that variable Civil liberties (CL1) is negative and significant for non-violent protests and not significant for violent protests. This implies that lack of civil liberties and social freedoms is a significant determinant for protest. The other significant political factor for both nonviolent and violent protest is the democratic score, i.e. Polity score, of countries. Ironically, the polity score variable has a positive relationship with the number of protests, implying that protests are higher in countries which are relatively less authoritarian and more democratic. One possible explanation for this could be that in countries which are not very strictly authoritarian, there is more room for political parties and civil activists to function properly and organize the groups and citizens for large scale protests. This result is in line with the so called 'intermediate/transitional regimes' thesis which postulate that regimes with intermediate levels of democratization are more prone to destabilization, than the consolidated authoritarianism or democracies (Gates, et al., 2000; Goldstone et al., 2010; Korotayev, et al., 2018; Grinin & Korotayev, 2010, 2012b). However, we should point out

[1] All GMM estimations are carried out using the xtabond2 package in Stata (see Roodman, 2009a).

here that Polity score is not a comprehensive measure of level and depth of democracy in a country. To capture more nuanced and broader dimensions of democracy, we consider three more variables from Polity IV dataset: 'executive recruitment competitiveness' (xrcomp), 'executive recruitment openness' (xropen), and 'executive constraints' (exconst). As the results from table 8 show the coefficient for both 'xropen' and 'exconst' variables are negative and significant in determining both nonviolent and violent protests. This implies that higher degree of openness of chief executives recruitment and institutional constraints on chief executives, will lead to less number of protests in a country. In other words the more democratic the political institutions of a country are the lesser will be the number of protests. This finding supports the view that demand for democracy and political rights are a significant determinant of Arab spring protests.

Table 8. Fixed Effects model estimates

	(1) Dem_NonVoil (FE model)	(2) Dem_Voil (FE model)
VARIABLES		
logGDPpc	111.9	-0.217
	(205.1)	(3.828)
GDPpcg	-9.638	-0.160
	(5.821)	(0.133)
CPI	-0.406	0.0310
	(2.066)	(0.0373)
HDI	835.3	15.27
	(1,379)	(27.09)
Domgovhealthexp	-26.58	-0.334
	(16.21)	(0.438)
Foodprodu	-0.149	-0.0101
	(0.678)	(0.0168)
Foodimports	7.730	0.0980
	(6.143)	(0.165)
Mobile	-0.0975	-0.00913
	(0.638)	(0.0131)
Oil_Rents	-6.666**	-0.0903*
	(2.635)	(0.0482)

Unemp_total	-1.278	0.137
	(10.11)	(0.515)
Unemp_Youth	0.569	0.0963
	(4.195)	(0.172)
PR1	-30.33	-0.184
	(30.56)	(0.547)
CL1	-131.8*	-1.397
	(70.94)	(1.399)
PTS_S	-16.37	-0.129
	(14.65)	(0.259)
polityIV	105.1***	0.746**
	(34.56)	(0.265)
xrcomp	385.3*	9.002
	(193.2)	(6.195)
xropen	-229.5***	-3.661**
	(49.07)	(1.643)
exconst	-260.2***	-2.518***
	(62.93)	(0.832)
Constant	377.3	3.152
	(1,603)	(32.14)
Observations	110	110
R-squared	0.799	0.681
Number of Countryname	14	14
Year FE	Y	Y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

However, it is unlikely that in MENA region, which struggles with developmental issues, the root causes of protest be purely due to political reasons and not economical. As we saw from table 8 the results from FE model is not showing any statistical significant for our economic variables, which we believe to be significant for explaining Arab spring protests, as explained in survey of literature section. Hence, we use a dynamic system GMM model as well. Results from our one-step and two-step system GMM regressions, for both non-violent and violent protests, are reported in table 9 below.

As we can see from table 9 below the system-GMM results show a positive and significant coefficient for the lagged value of nonviolent protests, and a positive but insignificant coefficient for the lagged

value of violent protests. This implies that more protests in the previous year has led to more number of protests in the currents year. Similarly, our GMM results show that, unlike the static model, economic variables get statistical significance too. As the results from table 9 show, GDP per capita level variable is negative and significant in explaining both nonviolent and violent protests. This implies that countries with higher levels of GDP per capita has experienced fewer number of violent and nonviolent protests. This result is in line with the fact that most of the gulf monarchical states like Qatar, Kuwait, Bahrain, Saudi Arabia and Oman, which are high in per capita GDP level (Above 15,000 USD; World Bank, 2017), were not hit by wave of Arab spring protests. So one determinant of protests in the Arab countries could be the lower levels of GDP per capital and lower standards of living, which is in line with the existing literature (Miguel et al, 2004; MacCulloch, 2004; MacCulloch and Pezzini, 2010; Parvin, 1973; Weede, 1981). However, GDP per capita growth, with an expected negative sign, is statistically insignificant for both nonviolent and violent protests.

Next economic variable is CPI which is positive and significant only for violent protests. This implies that inflation causes people to involve in violent protest. The next significant economic variable is HDI which is positive and significant for nonviolent protests only. One reason for this interesting result could be that in countries with higher HDI levels citizens are well-educated and informed enough to engage in nonviolent protests and peaceful political activities over the shortcomings of their regimes, but not violent protests. It is pointed in literature that education fosters the 'culture of democracy' and commitment to civil liberties (Hyman and Wright, 1979; Kohn, 1969; McCloskey and Brill, 1983), and also make them more tolerant (Lipset, 1981; Hall et al, 1986) and believe in peaceful ways of uprisings (Welzel and Deutsch, 2012).

The other economic factor which is posited in studies of weakening in 'social contract' of MENA, as a cause of Arab spring, is the cuts in the subsidies and public spending by the MENA regimes (Hinnebusch, R., 2019; Rougier, E., 2016). Due to lack of sufficient data on subsidies and public spendings, share of domestic government spending on health expenditure (as % of GDP) is used as a proxy for subsidies and overall public government spendings. As the estimates from table 9 show, the coefficient for government health expenditure is negative and statistically significant for both nonviolent and violent protests. This could imply that cuts in the government public spendings, especially after 1980s trend of economic liberalization reforms, could be a cause for the Arab spring protests. Other economic factor which is positive and significant for nonviolent protests is food imports. One explanation for this could be that high dependence on imported food meant that the global commodity price increases of the 2000s would transmit to domestic markets (Korotayev and Zikina, 2011; Ianchovichina et al., 2012) and, hence, lead to more protests. This finding holds despite the domestic food production index is being controlled for in the model.

For political variables, GMM results from table 9 show that the political rights index (PR1) is positive and statistically significant in determining both nonviolent and violent protests. Ironically, this implies that more political rights and freedoms leads to more protest. This result is in line with the so called 'intermediate/transitional regimes' thesis (Gates, et al., 2000; Goldstone et al., 2010; Korotayev, et al., 2018; Grinin & Korotayev, 2010, 2012b), which is similar to the finding from our static model in which a higher Polity score provokes more protests in a country. However, in our GMM model the Polity score is not statistically significant. Similarly, in contrast to the static model, now the civil liberties (CL1) variable is not statistically significant. Further, competitiveness of executive recruitment (xrcomp) now, in contrast to the static model, is negative and significant. This implies that the more competitive the processes of chief executive recruitments (like elections), the less is the number of protests. Further, in contrast to our static model, the variable executive recruitment openness (xropen) is not statistically significant. However, as in the static model, the coefficient for the variable constraints on chief executive (exconst) is negative for both violent and nonviolent protests, but is statistically significant only for violent protests.

We find no empirical support for the hypothesis that improvements in mobile use and social networks in MENA region have provoked protest activities (Costello et al, 2015; Lynch, 2007; Gladwell & Shirky, 2011); although, its coefficient for nonviolent protests is positive but not significant. Similarly we do not find any empirical support for total unemployment or youth unemployment rate (a proxy for 'youth budge') in determining the Arab spring protests. Furthermore, from our GMM results we do not find any empirical support for significance of oil-rents, but its coefficient sign is negative as in our FE model.

So as we see from results, using a dynamic GMM model greatly improves the explanatory power of the model and most of the economic variable also gets statistical significance in explaining the Arab spring protests. So from our dynamic model results one could claim that it is not only lack of political factors like democracy, political rights and civil liberties that caused Arab spring events, but equally important are some economic variables like level of GDP per capita , inflation, food imports and government spendings. In short one could say that Arab spring events did not have unidimensional causes, and both socio-economic and political grievances made MENA region's citizens to come out to the streets and protest.

Table 9. System GMM model estimates

	(1) Dem_NonVoilent (System_GMM)	(2) Dem_Voilent (System_GMM)	(3) Dem_NonVoilent (System_GMM)	(4) Dem_Voilent (System_GMM)
VARIABLES	(One-step)	(One-step)	(Two-step)	(Two-step)
L.Gdelt_Dem_NonVoil	0.125**		0.192***	
	(0.0545)		(0.0472)	
L.Gdelt_Dem_Voil		0.0549		0.0332
		(0.259)		(0.277)
logGDPpc	-132.8*	-2.103*	86.10	-1.813
	(61.60)	(1.059)	(84.28)	(1.242)
GDPpcg	-13.26	-0.240	-4.815	-0.281
	(8.074)	(0.178)	(8.742)	(0.174)
CPI	1.621	0.0558***	-5.736	-0.0273
	(1.583)	(0.0101)	(7.266)	(0.0664)
HDI	1,525*	24.52	0	0
	(808.2)	(14.87)	(0)	(0)
Domgovhealthexp	-46.49**	-0.878*	-49.70**	-1.006
	(21.10)	(0.489)	(20.47)	(0.574)
Foodprodu	-1.223	-0.0133	-0.186	0.00518
	(0.976)	(0.0130)	(0.622)	(0.0159)
Foodimports	9.221*	0.142	-3.522	-0.00525
	(4.793)	(0.0949)	(5.617)	(0.0732)
Mobile	0.684	0.000219	0.0107	0.000526
	(1.234)	(0.00901)	(0.637)	(0.00832)
Oil_Rents	-2.567	-0.0334	-11.64	-0.0456
	(1.781)	(0.0325)	(8.130)	(0.0418)
Unemp_total	-13.82	-0.0776	-41.96	-0.0311
	(15.95)	(0.273)	(32.41)	(0.141)
Unemp_Youth	1.241	0.00778	30.81	0.174
	(3.920)	(0.0866)	(22.66)	(0.167)

PR1	79.53***	1.642***	0	0
	(25.19)	(0.493)	(0)	(0)
CL1	10.19	-0.169	150.2	0
	(44.85)	(0.485)	(130.2)	(0)
PTS_S	5.945	0.0652	0	0
	(19.47)	(0.398)	(0)	(0)
polityIV	11.60	0.0621	-5.603	-1.716
	(24.15)	(0.255)	(5.131)	(1.398)
xrcomp	-233.9*	-2.685*	0	0
	(123.9)	(1.380)	(0)	(0)
xropen	20.72	0.297	-333.0	-1.347
	(15.91)	(0.466)	(261.0)	(1.294)
exconst	-106.3	-1.407**	0	4.969
	(73.81)	(0.635)	(0)	(4.373)
Constant	435.4	1.716	0	0
	(628.3)	(7.800)	(0)	(0)
AR(1) test	0.062	0.047	0.181	0.056
AR(2) test	0.238	0.288	0.209	0.257
Sargan J-test	0.031	0.195	0.031	0.195
Hansen J-test	1.000	1.000	1.000	1.000
Observations	98	98	98	98
Number of Countryname	14	14	14	14
Year FE	No	No	No	No

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

7. **Conclusion**

In this paper, we find strong empirical support from both FE and GMM models that political factors are important determinants of Arab spring events. For the economic factors we find empirical support

only from our dynamic GMM model, but not FE model. However, we do not find any empirical support for socio-demographic factors like cellphone use and youth-unemployment, from either of models.

Regarding economic factors, our GMM model supports the hypothesis that deteriorations in standards of living might have caused the Arab spring protests. Our GMM finding suggest that improvements in GDP per capita, higher government public expenditure on areas like health sector might lead to fewer nonviolent and violent protests. In contrast our finding suggest that increases in inflation and food prices has led to higher Arab spring protests. We find evidence that higher levels of HDI leads to more nonviolent protests, the reason for which could be that higher levels of development in human capital, like education, make people more averse to lack of political rights and civil liberties which make them raise their concerns peacefully rather than adhering to violent measures. In addition, people with higher levels of human development also have more to lose from violent protests, which creates a preference for nonviolent modes of protests.

Regarding political factors, our FE model results show that higher 'Polity score' leads to more nonviolent and violent protests. This finding supports the 'intermediate/transitional regimes' hypothesis which postulate that regimes with intermediate levels of democratization are more prone to protests and destabilization, than the consolidated authoritarianism or democracies. Similarly, from GMM model higher political rights leads to more nonviolent and violent protests. This finding also reinforces the 'intermediate regimes' thesis. Similarly, improvements in civil liberties and more nuanced dimensions of democratic processes in a society leads to less number of protests.

We should, however, point out that the results from this exercise are limited to only a specific set of events, which took place in a specific geographical area (MENA countries) at a specific stage in history. We might require a wider set of econometric studies to investigate the extent to which these results can be generalized to other countries. In other words, we should be careful in extending these results to form a general theory of determinants of protests against an incumbent regime. In addition, we should also note that certain structural factors which were not part of this study might have played a role in determining the extent of protests. One such factor might be external influences, which might have lent its support either to the regime or its opponents in various countries. Similarly, the dynamic interaction between the regime and the opposition might have also influenced the evolution of the extent and mode of protests. In this sense, this study should be looked upon as a preliminary empirical investigation into certain important determinants of protests in MENA countries during Arab Spring. We feel that in this limited sense, this study contributes to the literature by filling an important gap in the literature.

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