

# DISCUSSION PAPER SERIES

No. 9787

## TECHNOLOGICAL FOUNDATIONS OF POLITICAL INSTABILITY

Dmitry Dagaev, Natalia Lamberova,  
Anton Sobolev and Konstantin Sonin

*PUBLIC POLICY*



**Centre for Economic Policy Research**

[www.cepr.org](http://www.cepr.org)

Available online at:

[www.cepr.org/pubs/dps/DP9787.php](http://www.cepr.org/pubs/dps/DP9787.php)

# TECHNOLOGICAL FOUNDATIONS OF POLITICAL INSTABILITY

Dmitry Dagaev, Higher School of Economics, Moscow  
Natalia Lamberova, University of Maryland  
Anton Sobolev, University of California, Los Angeles  
Konstantin Sonin, Higher School of Economics, Moscow, and CEPR

Discussion Paper No. 9787  
December 2013

Centre for Economic Policy Research  
77 Bastwick Street, London EC1V 3PZ, UK  
Tel: (44 20) 7183 8801, Fax: (44 20) 7183 8820  
Email: [cepr@cepr.org](mailto:cepr@cepr.org), Website: [www.cepr.org](http://www.cepr.org)

This Discussion Paper is issued under the auspices of the Centre's research programme in **PUBLIC POLICY**. Any opinions expressed here are those of the author(s) and not those of the Centre for Economic Policy Research. Research disseminated by CEPR may include views on policy, but the Centre itself takes no institutional policy positions.

The Centre for Economic Policy Research was established in 1983 as an educational charity, to promote independent analysis and public discussion of open economies and the relations among them. It is pluralist and non-partisan, bringing economic research to bear on the analysis of medium- and long-run policy questions.

These Discussion Papers often represent preliminary or incomplete work, circulated to encourage discussion and comment. Citation and use of such a paper should take account of its provisional character.

Copyright: Dmitry Dagaev, Natalia Lamberova, Anton Sobolev and Konstantin Sonin

CEPR Discussion Paper No. 9787

December 2013

## **ABSTRACT**

### Technological Foundations of Political Instability

There has been a wide-spread belief that elections with a wide franchise following removal of an oppressive dictator lead to establishment of a government that is not vulnerable to mass protest. At the same time, most of the post-World War II non-constitutional exits of recently-installed autocratic leaders were caused by elite coups, rather than popular protests. The recent experience of Egypt, where the democratic post-Mubarak government, a result of the Arab Spring, collapsed after having had almost uninterrupted protests since its first day in office, offers a striking counterexample to both of these patterns. We demonstrate that this is a general phenomenon: the same technological shock, arrival of social media, that makes the incumbent vulnerable, lays foundation for continuous instability of the subsequent democratic government. Our theoretical model, which incorporates protest into a Downsian framework, takes into account specific features of modern protests: the significant role of social media and the absence of the partisan or personalized leadership during popular unrest. Case studies of the Arab countries with and without large-scale protests corroborate our theoretical findings.

JEL Classification: C42, D74 and L96

Keywords: Arab spring, autocracy, collective action, regime change and social media

Dmitry Dagaev  
Higher School of Economics  
Kochnovskiy Proezd 3  
Moscow 125319  
RUSSIA

Natalia Lamberova  
University of Maryland  
College Park, MD 20742  
USA

Email: [ddagaev@hse.ru](mailto:ddagaev@hse.ru)

Email: [natalia.lamberova@gmail.com](mailto:natalia.lamberova@gmail.com)

For further Discussion Papers by this author see:  
[www.cepr.org/pubs/new-dps/dplist.asp?authorid=176896](http://www.cepr.org/pubs/new-dps/dplist.asp?authorid=176896)

For further Discussion Papers by this author see:  
[www.cepr.org/pubs/new-dps/dplist.asp?authorid=177925](http://www.cepr.org/pubs/new-dps/dplist.asp?authorid=177925)

Anton Sobolev  
Department of Political Science  
University of California  
Los Angeles, CA  
USA

Email: [asobolev.hse@gmail.com](mailto:asobolev.hse@gmail.com)

For further Discussion Papers by this author see:  
[www.cepr.org/pubs/new-dps/dplist.asp?authorid=177926](http://www.cepr.org/pubs/new-dps/dplist.asp?authorid=177926)

Konstantin Sonin  
Higher School of Economics  
Kochnovskiy Proezd 3  
Moscow 125319  
RUSSIA

Email: [ksonin@gmail.com](mailto:ksonin@gmail.com)

For further Discussion Papers by this author see:  
[www.cepr.org/pubs/new-dps/dplist.asp?authorid=145555](http://www.cepr.org/pubs/new-dps/dplist.asp?authorid=145555)

Submitted 08 December 2013

# 1 Introduction

Developments that followed the start of the Arab Spring revolutions differ drastically from what has become familiar in the history of political unrests over the last two centuries. First, these revolutions were unexpected and the results were unpredictable (Geddes, Wriqth, and Frantz, 2012). For years, academics had been trying to explain “the most anomalous aspect of Arab politics: the persistence of undemocratic rulers” (Gause III, 2011). Second, once the protest started, the pace of change was extremely swift. In Tunisia, the “irremovable” president Ben Ali resigned after 28 days of protest. Third, the protests were “leaderless” (Cannistraro, 2011). Finally, new governments were themselves dismissed soon after they came to power: e.g., the first elected post-Mubarak government, a result of the Arab Spring, collapsed in mid-2013 after a year of almost uninterrupted protests.

Our paper seeks to explain why the popular protests during the Arab Spring have not ceased after the successful ousting of rulers, and why the incumbents that gained office as a result of the popular protests have been subsequently swept away by the next wave of protests. In contrast with Meirowitz and Tucker (2013) who provide reasons why modern revolutions should be “one-shot deals,” we argue that the technological shock of the 21<sup>st</sup> century — the arrival of new media — has laid the foundation for continuous instability of undemocratic governments.

New technologies has been long recognized as facilitating not only more efficient economic interactions, but also lowering the costs of political collective action. A non-democratic ruler who is aware of these effects might recognize the danger the new technologies pose for his survival. In the 19<sup>th</sup> century tsar Nicolas I was able to curb the spread of railroads across Russia and thus maintain the high costs of collective action at the expense of economic development (Acemoglu and Robinson, 2006). However, there is a critical difference between a railroad network and Facebook. While the cost of late arrival of rail transportation might be huge, they are spread over years, if not decades. In the 21<sup>st</sup> century, Egypt’s Hosni Mubarak met the costs of shutting down internet immediately. Castells (2012) provides a raw estimate: “The five-day shutdown of internet access in Egypt resulted in a loss of about US\$90 million in revenue due to blocked telecommunications and internet services, which account for around US\$18 million per day”. In fact, even shutting down the network entirely would not be enough as there were multiple ways of circumventing the obstacle via telephone landlines.<sup>1</sup>

We argue that the rapid decline of costs of collective action, resulting from the emergence

---

<sup>1</sup>Internet users reached phone servers abroad, which automatically forwarded messages to volunteer-provided computer networks, which in turn forwarded them back to Egypt.

of new technology that cannot be controlled by incumbents, has a significant impact on the dynamics of political change. This explains why popular unrest during “the Arab Spring” has not ceased since the successful ousting of incumbents. In our baseline model, which incorporates protest within a Downsian framework, the next leader is determined by the pool of citizens who participated in the protest<sup>2</sup>. As people’s willingness to participate in a revolt depends on the policy platform of both the incumbent and the expected next leader, there is a possibility that the revolt produces a more radical incumbent who himself can be overthrown<sup>3</sup>. The exogenous parameters that affect the protest dynamics include the individual cost of citizens’ participation and coordination, which were greatly reduced by the spread of new social media, and the incumbent’s radicalism.

Our theoretical model takes into account specific features of modern protests: the significant role of internet, in particular social media; the absence of the partisan leadership during popular unrests; and the persistence of protests even after a change of the incumbent. There has been a significant body of research on each of these areas. We use these three observations as the building blocks of our theory, and show how they fit into our model.

There is a large body of literature that looks into the role of internet as an information-transmitting network. From the dictator’s standpoint, the role is twofold. First, the net is a source of information, which improves economic efficiency. Second, the net is a coordination tool that might facilitate collective action against the incumbent. The former role can be illustrated in the context of the Soviet information-control policy. Egorov, Guriev, and Sonin (2009) describe Gorbachev’s dilemma in mid-1980s: “Without allowing some amount of free speech (*glasnost*), reforms of the highly inefficient bureaucracy and the command economy more generally seemed all but impossible. At the same time, free flow of information would undermine the very foundation of the Communist Party’s rule.” Following the same logic, three decades later internet censorship in China does not eliminate criticism of the government. Lorentzen (2013) argues that in the new media era autocratic regimes like China face “media independence” trade-off between demand for information to control lower-level officialdom and risks of coordinated uprisings. King, Pan, and Roberts (2012) find that “[blog] posts are censored if they are in

---

<sup>2</sup>This mechanics partially goes in line with Bueno de Mesquita et al. (2005) “selectorate model”. In this model revolutions do not lead to democracy, but the new rulers face the same incentives that predecessors do.

<sup>3</sup>The fact that new incumbent is located on the opposite side of policy space does not necessary mean transition to democracy. Geddes (2007) argue that autocrats can pose radically different policy positions: “Some contemporary authoritarian regimes have protected the interests of the rich, but others have redistributed land, nationalized natural resources, and expropriated other“

a topic area with collective action potential and not otherwise. Whether or not the posts are in favor of the government, its leaders, and its policies has no effect on the probability of censorship”. Here information per se is not regarded as a danger for the incumbent, even if it reveals officials’ misdeeds. Magaloni (2006) argues that absence of credible information does not allow opposition to organize a major unrest. Svolik (2012) stresses that the information about incumbent’s action makes opposition more willing to rebel. Ginkel and Smith (1999) state that if decision to rebel depends on the probability of success then “given the limited amount of free press and other form of information, the general public has little idea about whether the government can survive a major election”.

The role of internet as a tool of coordination has become increasingly important since the creation of social networks (Tilly and Tarrow, 2006). In particular, it enables ‘many-to-many’ communication, and facilitates in-group coordination in violent political action – the functions that previously belonged to other organizational technologies (Weinstein, 2007). Iskander (2011) observes: “New media do not consist simply of information being delivered to an audience as in the traditional mass media model. Internet, and in particular social media, generate discussion and interaction on a many-to-many basis (Curran and Gurevitch, 2005, p. 12), which support the creation of networked communities (cf. Castells, 2004). During the 2011 protests, information snowballed via Facebook and Twitter as information was spread not only from person to person but from one person’s network to another’s, with people within each network forwarding to their networks, and so on”. This happens because individual-to-individual communication mitigates both free-rider and coordination problems that stifle uprisings.<sup>4</sup> Nor surprisingly, numerous descriptive studies highlight its importance during the events of the Arab Spring (Iskander, 2011, Valenzuela, Arriagada, and Scherman, 2012).

The second distinct feature of the Arab Spring was the lack of well-organized partisan or personal leadership. Case studies (e.g., Pollack et al, 2011) show the lack of common political, religious, or social characteristics among protesters and their local leaders. Furthermore, a positive agenda of protesters was not formulated beforehand: the people united against the current incumbent, but not around a particular party or a leader. This delayed process of preference aggregation contrasts sharply with the protests of the pre-social media era. One example of those is the mass protest that led to fall of the Slobodan Milosevic in October 2000. With high costs of organization, protests had to heavily rely on political parties: diverse political preferences and inability of party leaders to agree upon a common agenda led to a

---

<sup>4</sup>Pierskalla and Hollenbach (2013) find that the number of cell-phones increases the likelihood of a violent collective action in Africa.

prolonged inability to mount a credible challenge to the incumbent dictator. During ten years of Slobodan Milosevic's rule after the fall of communism, there were eight failed and one successful attempt to form a wide coalition of opposition parties (Spoerri, 2008). The process of finding a common ground started in 1990 with the emergence of the coalition of six parties, the Associated Opposition of Serbia, which broke shortly after a series of power struggles, policy disagreements, and personality clashes. It was only ten years later that the protest which facilitated Milosevic's downfall took place, as the leader of the united opposition, the Democratic Opposition of Serbia, was able to ensure the non-involvement of the crucial military unit on the behalf of Milosevic (Bujosevic and Radovanovic, 2003).

The Milocevic's case was typical. In their analysis of the third wave of democratization, Howard and Roessler (2006) conclude that successful coalition formation inside the opposition was the only significant predictor of the ultimate success of protests. In contrast, the events of the Arab Spring allow us to argue that it might be no longer true. As the emergence of social media enabled the users to coordinate their actions easily and in real time, the necessity of a special organizing body, a political party or even an opposition leader's informal headquarters has subsided (see Ostrom, 2009, for a survey of literature on collective actions and Kuran, 1989, 1991, on collective action in political protest). Now, instead of building a coalition, multiple leaders are acting in unison, while trying disguise their agenda (Sikk, 2006).

The third distinctive feature of recent protests is their persistence even after the incumbent is removed from power. The vulnerability of the rule of the new incumbent has been common knowledge for centuries, starting with the work of Machiavelli (Machiavelli, n.d.). Bueno De Mesquita and Smith (2011) argue that the incumbent is likely to lose his position early at the beginning of his rule. History provides us with cases of military coups against the new incumbent that was brought to power during a popular uprising. One of the early historical examples is the three-month rule of the Roman Emperor Pertinax, who emerged in 193 as the incumbent after the uprising against the Commodus. He held a wide popular support, but was unable to secure the support of his guard as the hopes of Praetorians for large monetary rewards waned, which led to his ultimate downfall. "A hasty zeal to reform the corrupted state, accompanied with less prudence than might have been expected from the years and experience of Pertinax, proved fatal to himself and to his country. His honest indiscretion united against him the servile crowd, who found their private benefit in the public disorders, and who preferred the favor of a tyrant to the inexorable equality of the laws." (Gibbon, 1776).

Using data on 316 autocracies between 1945 and 2002, Svulik (2009) shows that non-



constitutional exits of leaders who were in office for less than one year were generally caused by coups. We argue that new technologies that were brought about by the Facebook era make autocrats vulnerable to popular uprising, rather than a coup. Acemoglu and Robinson (2001, 2009) analyze the case where disenfranchised and relatively poor minority forces democratization in periods of low opportunity costs (such as recessions), while former elites, which constitute a better-off minority, can mount a coup and win the power back. In either case, the opposition group rises when the relative cost of mounting a protest falls for this group. In contrast, our model does not assume any dissimilarities in individual costs of collective action. Meirowitz and Tucker (2013) suggest that the protest becomes a one-shot deal, as the citizens observe the low quality of the incumbent in power, and become pessimistic about the possible replacements. Our study suggests that the protests might recur even after a successful regime change. Binder and Francois (2013) show how the existence of a group of intolerant to transgressions voters can generate enduring political change within a fixed set of formal institutions: the rational citizens can become intolerant to transgressions, assuming that the next leader would perform better, if they believe that there are enough people that do not tolerate transgressions.

Kricheli, Livne, and Magaloni (2011) analyze the conditions that facilitate the civil uprising in hostile regimes and find that more repressive autocratic regimes are in principle more stable in the sense that citizens are less willing to take to the street. However, given the protest takes place, the more repressive autocratic regime is more likely to fail, as such protest sends other citizens a stronger signal about popular discontent of the incumbent. Part of our analysis is consistent with their framework (the regimes that have greater military capacity indeed appear to be more stable), but potential members of the protest in our framework do not need an additional signal to organize the collective action, thus do not react to them. Hence, the recurrent protest in our model is motivated by entirely different dynamics, and can endure even after the successful replacement of the autocratic ruler.

Finally, a number of recent studies emphasize the importance of internet during the events of the Arab Spring (e.g., Iskander, 2011 and Valenzuela, Arriagada, and Scherman, 2012). Newly-arrived social networks enabled many-to-many communication and facilitated in-group coordination in violent political action – the functions that previously belonged to other organizational technologies (Castels, 2004, Curran and Gurevitch, 2005, Weinstein, 2007 and Faris, 2008).<sup>5</sup>

---

<sup>5</sup>Diamond and Plattner (2012) describe the significant role of the mobile technology in organizing peaceful protest (e.g., during the so-called Orange Revolution in Ukraine in 2004). Aker, Collier, and Vicente (2013) compare the impact of two-way individual-to-individual communication channels (hot-line mobile phones, SMS with electoral information) with one-way individual-to-mass communication channels (free newspapers with in-

The rest of the paper is organized as follows. Section 2 contains a model, while Section 3 illustrates model’s findings. Section 4 concludes.

## 2 Theory

### 2.1 Setup

We assume that the citizens are uniformly distributed over the set  $[0, 1]$  that represents the standard one-dimensional policy space. The position  $x^D$  of the initial incumbent is exogenously given on  $[0, 1]$ .

The utility of the citizen  $i$ , given the incumbent’s position is  $x$ , is denoted by  $v_i(x)$  and equals

$$v_i(x) = -|x - x_i|.$$

Each citizen decides whether to participate in the protest or not. According to this decision, all citizens can be classified into two groups – those who participate in a protest against the incumbent  $x^D$ , and those who do not. We assume that those who protest form a segment  $[a, b]$  in the set of all citizens, such that  $a, b \in [0, 1]$  and  $a < b$ .<sup>6</sup> We denote the set of all such segments by  $\Delta$ .

**Definition 1** *The set  $P$  is called a protest if  $P \in \Delta$ .*

For each set  $Y \subseteq [0, 1]$ , let  $\bar{Y}$  be the set  $[0, 1] \setminus Y$ . Then, if  $P$  is a protest, then  $\bar{P}$  is the set of all citizens who do not protest. To each protest  $P$  we attribute the policy platform of formation about elections) to found no significant difference in the impact on turnout; yet, they found that newspapers are still the most efficient tool of mobilization of citizens’ demand for accountability. Bailard (2012) demonstrated that the use of internet reduced individuals’ perception of the fairness of Tanzanian general election in 2010. Using the distance of the electoral district from the backbone internet service providers an instrument for internet penetration, Miner (2012) finds positive impact of internet usage on the protest vote in Malaysia. Focusing on the link between the availability of ADSL-based internet services and political participation in Italian cities, Campante, Durante, and Sobbrío (2013) established substantial negative effect on turnout in parliamentary elections between 1996 and 2008 and found positive impact of internet on other forms of political participation (e.g. local online and offline grassroots protest movements). Beissinger (2007) shows that dissatisfied individuals may gather information about possible risks and rewards of participating in protest from neighbouring (or similar) countries.

<sup>6</sup>Our results extend to the case when the protest is any Lebesgue-measurable subset of  $[0, 1]$ , i.e. not necessarily connected.

the *expected new incumbent* who is the median participant of the protest,  $x^P = \frac{1}{2}(a + b)$ .<sup>7</sup> That is, for each protest we find such a protester, who's ideal policy position is the bliss point of the median protester. In a standard Downsian framework such person enjoys the widest support, should the elections be held among the protesters. Thus, it is natural that he/she is assumed to be the expected new incumbent should the protest succeed.

We denote the personal cost of participation in a protest by  $c$ . The important assumption is that  $c$  does not depend on the outcome of the protest. Our analysis is based on the idea that the citizens choose to protest whenever the expected new incumbent is better than the current leader, taking into the account the individual costs of participation in protest. Thus, the citizens ignore the fact that the expected new incumbent is not guaranteed to consolidate his position in office.

Now we define several characteristics of the protests.

**Definition 2** *Protest  $P$  is said to be a rational protest against the incumbent  $x^D$ , if  $v_i(x^P) - c \geq v_i(x^D)$  for each  $i \in P$ .*

In case of a rational protest, every participant should get the positive utility from the change of the incumbent if the protest is successful.

**Definition 3** *Rational protest  $P$  is called a coherent protest against the incumbent  $x^D$ , if  $v_j(x^P) - c < v_j(x^D)$  for each  $j \notin P$ .*

Thus, the coherent protest requires the rationality of both those who participate in the protest, and those who do not.

Finally, we need a parameter that characterizes the extent to which the information about protest is spread. We assume that each citizen  $i$  is aware of the date and time of the actual protest with probability  $\delta$  and is not aware with the remaining probability. With steam locomotive, a communication tool of the 19th century,  $\delta$  is low and many of those who would have been glad to pay  $c$  to replace the incumbent with the expected new incumbent, stay at home as they are not aware of the protest taking place. With Facebook and Twitter, the value of  $\delta$  is much higher. Thus, for any given protest  $P$ , the share of those who actually come to the Tahrir square is  $\delta P$ .

---

<sup>7</sup>More generally, the *expected new incumbent* following protest  $P$  might be defined as some citizen  $x^P = \int_D x dG_D(x)$ , where  $G_D$  is a c.d.f. of some probability distribution and  $D = D(P) \subset [0, 1]$  is the franchise formed as a result of protest  $P$ . If  $G$  is a uniform distribution over the set of protesters and  $D = P = [a, b]$ , then  $x^P = \frac{a+b}{2}$ , the median of the protest. The median voter position when  $D = [0, 1]$  corresponds to the outcome of democratic elections.

The success of the protest depends only on the number of people participating in it. Let  $\nu$  be the share of the population needed to overthrow the incumbent. This parameter may be interpreted as the military capacity of the incumbent. The higher is  $\nu$ , that the incumbent can devote to the suspension of the protest, the more numerous should it be so succeed. Mathematically, in the following analysis the crucial role is played by the ratio  $\frac{\nu}{\delta}$  of military capacity  $\nu$  to the information parameter  $\delta$  rather than the values of  $\nu$  and  $\delta$  themselves. To keep things tractable, we will often use variable  $\mu = \frac{\nu}{\delta}$ . However, one may also think of both parameters separately as they characterize different aspects of political environment. Also, comparative statics with respect to either of them is more meaningful, than one with the respect to the ratio.

**Definition 4** *A coherent protest  $P$  is successful if  $\delta|P| \geq \nu$ . If protest  $P$  is successful, then the expected new incumbent  $x^P$  becomes the new incumbent.*

Depending on the parameters of the model and the incumbent's initial position, the successful protests against him may or may not exist.

**Definition 5** *The incumbent  $x^D$  is called stable, given parameters  $c, \delta$ , and  $\nu$ , if there is no successful protest against him.*

We start our analysis with a one-shot model, and then turn to the multi-period case. The model with  $T$  periods ( $T \geq 1$ ) has the following timing. At the beginning of each period the costs of collective action  $c$ , information parameter  $\delta$ , and the military capacity  $\nu$  are fixed. The position of the current incumbent  $x^D$  is also fixed and is determined at the end of the previous period. The position of the incumbent in the first period is exogenously given. In case of a successful protest the expected new incumbent comes to power and becomes the incumbent in the next period, and so on (if there are multiple successful protests, there are multiple equilibrium paths). If there is no such protest, the incumbent stays in power. The life-time payoff of the citizens is the sum of their single-period payoffs.

## 2.2 Analysis

Here we analyze the one-period case and consider the statics of the coherent protests. First, it is easy to see that the incumbent never participates in a rational protest against himself. Formally, if  $P$  is a rational protest against incumbent  $x^D$ , then  $x^D \notin P$ .

Second, any rational protest has a very simple form. If  $P$  is a rational protest against the incumbent  $x^D$ , then either  $P = [0, a]$  for some  $a \in (0, 1)$ , or  $P = [b, 1]$  for some  $b \in (0, 1)$ .

That is, all rational protests form on one of the ends of political spectrum: there is no case of a rational protest that exists on the  $[0, 1]$  interval, but includes neither 1 nor 0.

The next step is to characterize coherent protests as follows. If  $P$  is a coherent protest against the incumbent  $x^D$  and  $P = [0, a]$  for some  $a \in (0, 1)$ , then  $c \leq x^D$  and  $a = \frac{2}{3}(x^D - c)$ . If  $P$  is a coherent protest against the incumbent  $x^D$  and  $P = [b, 1]$  for some  $b \in (0, 1)$ , then  $c \leq 1 - x^D$  and  $b = \frac{1}{3}(2x^D + 1 + 2c)$ . Thus, the marginal supporter of the protest has a preferred policy position that ensures his indifference between taking to streets or staying at home.

Combining the above observations we arrive at a full characterization of coherent protests.

**Proposition 1** *For any incumbent  $x^D$  and for any individual cost of protest  $c$ , there exist no more than two coherent protests against  $x^D$ . They can be described as follows.*

(i) *Suppose that individual costs of protests are relatively low,  $c < \frac{1}{2}$ . Then for a radically left incumbent,  $x^D < c$ , there exists a coherent protest on the right; for a radically right incumbent,  $x^D > 1 - c$ , there exists a coherent protest on the left; and for a non-radical incumbent,  $c < x^D < 1 - c$ , there exist coherent protests on both sides of political spectrum.*

(ii) *Suppose that individual costs of protests are relatively high,  $c > \frac{1}{2}$ . Again, when the incumbent is radically left,  $x^D < c$ , there exists a coherent protest on the right; for a radically right incumbent,  $x^D > 1 - c$ , there exists a coherent protest on the left; and there are no coherent protests when the incumbent is non-radical,  $c < x^D < 1 - c$ .*

In order to analyze the dynamics of political change, we need to find the position of the expected new incumbent in case of a coherent protest. In case of a coherent protest on the right, the expected new incumbent has a preferred policy position

$$x^P = \frac{1}{3}(x^D + 2 + c),$$

while in case of a coherent protest on the left, his position is

$$x^P = \frac{1}{3}(x^D - c).$$

Let us now consider developments that follow formation of a protest. If coherent protest  $P$  occurs on the left, then  $P = [0, \frac{2}{3}(x^D - c)]$ . Hence, the protest  $P$  is successful if and only if  $\frac{2}{3}(x^D - c) \geq \mu$ , or, equivalently,

$$x^D \geq \frac{3}{2}\mu + c.$$

Naturally, the more right-wing is the incumbent (the larger is  $x^D$ ), the wider is the range of parameters  $\mu$  and  $c$  for which a successful protest on the left is possible.

If coherent protest  $P$  occurs on the right, then  $P = [\frac{1}{3}(2x^D + 2c + 1), 1]$ . Thus, the condition for protest  $P$  to be successful is  $1 - \frac{1}{3}(2x^D + 2c + 1) \geq \mu$ , or, equivalently,

$$x^D \leq 1 - c - \frac{3}{2}\mu.$$

The range of leftist incumbents against which the successful protest exists is wider when the costs of collective actions  $c$  and the minimal number of participants in a successful protest  $\mu$  are low.

Therefore, there are several different types of incumbent positions with respect to the existence of successful protests. Using the fact that  $\frac{3}{2}\mu + c > 1 - c - \frac{3}{2}\mu$  is equivalent to  $c > \frac{1-3\mu}{2}$ , we obtain the following result.

**Proposition 2** (i) *Suppose that the individual costs of protest are relatively high:  $c > \frac{1-3\mu}{2}$ . The “extremist” incumbent that is located on segments  $[0, 1 - c - \frac{3}{2}\mu]$  and  $[\frac{3}{2}\mu + c, 1]$  will be successfully overthrown from the right and from the left, respectively, while the “centrist” incumbent located on segment  $(1 - c - \frac{3}{2}\mu, \frac{3}{2}\mu + c)$  is stable.*

(ii) *Suppose that the costs of protest are relatively low:  $c < \frac{1-3\mu}{2}$ . The incumbent located on the segments  $[0, \frac{3}{2}\mu + c]$  and  $[1 - c - \frac{3}{2}\mu, 1]$  will be successfully overthrown from the right and from the left respectively, while for the incumbent from the segment  $(\frac{3}{2}\mu + c, 1 - c - \frac{3}{2}\mu)$  there are successful protests on both sides against him.*

Figures 1 and 2 illustrate the results described in Proposition 2.

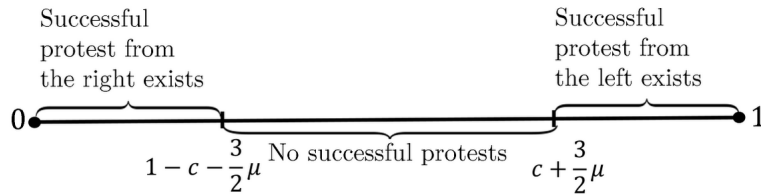


Figure 1. Vulnerability of incumbents when the costs of protest are high

$$(c > \frac{1-3\mu}{2})$$

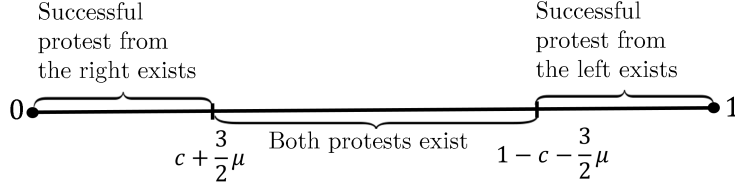


Figure 2. Vulnerability of incumbents when the costs of protest are low

$$(c < \frac{1-3\mu}{2})$$

Figures 3-5 map protest zones on the plane  $(x^D, c)$  given different values of parameter  $\mu = \frac{\nu}{\delta}$ . The zone of the successful "right" protest is squared, the zone of successful "left" is covered by inclined lines, and the zone with possibility of successful protests on both sides is uniformly colored. The zone of stability of the dictator remains white. Comparative statics with respect to  $\nu$ , the military capacity, is the same as for  $\mu$ ; comparative statics with respect to  $\delta$ , which parametrizes information penetration, has the opposite sign.

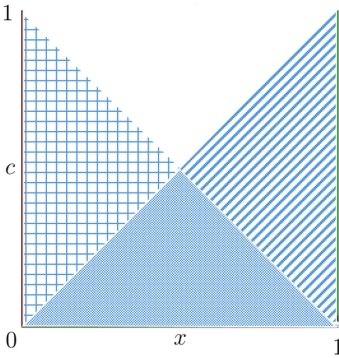


Figure 3. Protest zones for

$$\mu = \frac{\nu}{\delta} = 0.$$

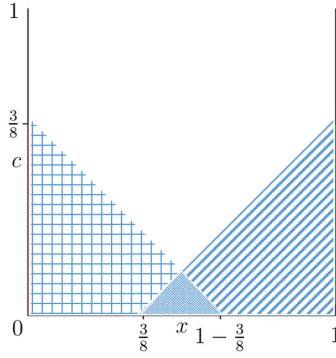


Figure 4. Protest zones for

$$\mu = \frac{\nu}{\delta} = \frac{1}{4}.$$

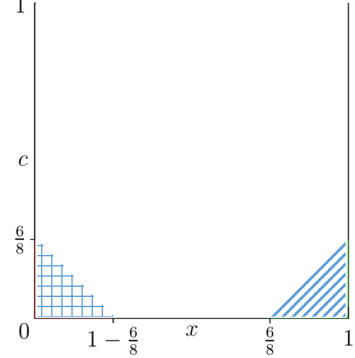


Figure 5. Protest zones for

$$\mu = \frac{\nu}{\delta} = \frac{1}{2}.$$

Let us now consider the case when a successful protest is followed by a successful protest in the next period. It is straightforward to demonstrate that for protest to continue for multiple periods (possibly infinitely), there should be a successful protest in two consecutive periods. Thus, the two-period case is of special importance for us: if the leader emerging in "+2" period might has the same (or similar) position as the initial (time "0" leader), there is a possibility of infinite "oscillation", with no convergence even in the very-long run. In contrast, if the

incumbent that emerged after a successful protest is stable, there will be no protests thereafter. Our next goal is to identify the range of parameters for which convergence to stability is possible.

We start with the case  $T = 2$ . Proposition 3 describes the set of “stability zones” as a function of parameters  $c, \mu$ , and  $x^D$ . All proofs are relegated to the appendix.

**Proposition 3** (i) *Suppose that the individual costs of protests are high:  $c > 1 - 2\mu$ . If the incumbent is located in the “center”,  $x^D \in (1 - c - \frac{3}{2}\mu, \frac{3}{2}\mu + c)$ , there are no successful protests against him. If the incumbent is “extremist”,  $x^D \in [0, 1 - c - \frac{3}{2}\mu]$  or  $x^D \in [\frac{3}{2}\mu + c, 1]$ , the new incumbent that emerges after a successful protest is in the zone of incumbent stability.*

(ii) *Suppose that the individual costs of protests are intermediate:  $1 - 2\mu > c > \frac{1-3\mu}{2}$ . If the incumbent located in the “center”,  $x^D \in (1 - c - \frac{3}{2}\mu, \frac{3}{2}\mu + c)$ , then there are no successful protests. If  $x^D \in [0, \frac{4c+9\mu-4}{2})$  or  $x^D \in (\frac{6-4c-9\mu}{2}, 1]$ , then a single protest in period 1 results in a stable incumbent. Finally, if  $x^D \in [\frac{4c+9\mu-4}{2}, 1 - c - \frac{3}{2}\mu]$  or  $x^D \in [c + \frac{3}{2}\mu, \frac{6-4c-9\mu}{2}]$ , the incumbent is overthrown in period 1, and the new incumbent is again in the unstable zone (and thus is overthrown in period 2).*

(iii) *Suppose that the individual costs of collective action are low,  $c < \frac{1-3\mu}{2}$ . There are no stability zones, and there will be successful protests in all periods.*

Proposition 3 suggests that, given the costs of collective action are sufficiently high ( $c > 1 - 2\mu$ ), the protest will no persist for more than one period. Indeed, if the initial incumbent is centrist,  $x^D \in (1 - c - \frac{3}{2}\mu, \frac{3}{2}\mu + c)$ , his position in office is secure. If the incumbent is extremist, either left-wing,  $x^D \in [0, 1 - c - \frac{3}{2}\mu]$ , or right-wing,  $x^D \in [\frac{3}{2}\mu + c, 1]$ , then new incumbent that emerges in a stability zone, and his position is secure afterwards. This finding is rather intuitive: as costs of collective action are high, the initial incumbent must be sufficiently extremist to provoke a successful protest. In this case, a protest against him is wide enough to guarantee that the new leader is close to the center, and, hence, does not provoke enough displeasure to be successfully removed from power. In sum, if the costs of collective action together with the army capabilities are large enough ( $c + 2\mu > 1$ ), the protests cannot last for more than one period.

However, the situation is completely different when the costs of collective action are intermediate,  $1 - 2\mu > c > \frac{1-3\mu}{2}$ .<sup>8</sup> In this case, the leader’s position might oscillate between left and right wing of the political spectrum. To see this, we let  $\{x_n^D\}$  denote the sequence of the

<sup>8</sup>If  $c < \frac{1-3\mu}{2}$ , then for  $c + \frac{3\mu}{2} < x^D < 1 - c - \frac{3\mu}{2}$  there exist two stable protests (one from each side of the incumbent’s position). Therefore, in the case of low costs  $c$  the dynamics of incumbents positions is not deterministic.



leader positions during the chain of successful protests,  $x_1^D = x^D$ . We next need to consider the convergence properties of two sequences, the sequence  $\{x_{2n-1}^D\}$  of leaders' positions in odd periods and the sequence  $\{x_{2n}^D\}$  of leaders' positions in even periods.

**Proposition 4** *Suppose that the costs of collective action are intermediate:  $1 - 2\mu > c > \frac{1-3\mu}{2}$ .*

(i) *If the incumbent is centrist,  $1 - c - \frac{3}{2}\mu < x^D < c + \frac{3}{2}\mu$ , then  $x^D$  is stable.*

(ii) *If the incumbent is leftist,  $x^D < \frac{4c+9\mu-4}{2}$ , then the new incumbent  $x^P = \frac{1}{3}(x^D + 2 + c)$  that emerges after a successful protest in the first period is stable. Similarly, if  $x^D > \frac{6-4c-9\mu}{2}$ , then the new incumbent  $x^P = \frac{1}{3}(x^D - c)$  is stable.*

(iii.a) *If  $\frac{4c+9\mu-4}{2} < x^D < \frac{1-c}{4}$ , then the sequence of odd-period leaders' positions  $\{x_{2n-1}^D\}$  is strictly increasing towards  $\frac{1-c}{4}$ ; the sequence of even-period leaders' positions  $\{x_{2n}^D\}$  is strictly increasing towards  $\frac{3+c}{4}$ .*

(iii.b) *If  $\frac{1-c}{4} < x^D < 1 - c - \frac{3}{2}\mu$ , then the sequence of odd-period leaders' positions  $\{x_{2n-1}^D\}$  is strictly decreasing towards  $\frac{1-c}{4}$ ; the sequence of even-period leaders' positions  $\{x_{2n}^D\}$  is strictly decreasing towards  $\frac{3+c}{4}$ .*

(iii.c) *If  $c + \frac{3}{2}\mu < x^D < \frac{3+c}{4}$ , then the sequence of odd-period leaders' positions  $\{x_{2n-1}^D\}$  is strictly increasing towards  $\frac{3+c}{4}$ ; the sequence of even-period leaders' positions  $\{x_{2n}^D\}$  is strictly increasing towards  $\frac{1-c}{4}$ .*

(iii.d) *If  $\frac{6-4c-9\mu}{2} > x^D > \frac{3+c}{4}$ , then the sequence of odd-period leaders' positions  $\{x_{2n-1}^D\}$  is strictly decreasing towards  $\frac{3+c}{4}$ ; the sequence of even-period leaders' positions  $\{x_{2n}^D\}$  is strictly decreasing towards  $\frac{1-c}{4}$ .*

Figures 6 and 7 illustrate parts (iii.a) and (iii.b) of proposition 4. If the initial incumbent is located in the center ( $1 - c - \frac{3}{2}\mu < x^D < c + \frac{3}{2}\mu$ ), then he is stable. In other cases he will be removed. However, the position of the new incumbent depends on the position of his predecessor. If the initial incumbent was very radical ( $x^D < \frac{4c+9\mu-4}{2}$  or  $x^D > \frac{6-4c-9\mu}{2}$ ), then the new incumbent is stable because he will appear near the center of the political spectrum. In all other situations the positions of the new incumbents will oscillate towards the limit points  $\frac{1-c}{4}$  and  $\frac{3+c}{4}$ .

The list of possible parameter combinations in Proposition 4 skips the non-generic case of "pure" oscillation. If  $x^D = \frac{1-c}{4}$ , then both  $\{x_{2n-1}^D\}$  and  $\{x_{2n}^D\}$  are constant sequences,  $x_{2n-1}^D = \frac{1-c}{4}$  and  $x_{2n}^D = \frac{3+c}{4}$ . In the symmetric case, if  $x^D = \frac{3+c}{4}$ , then both  $\{x_{2n-1}^D\}$  and  $\{x_{2n}^D\}$  are constant sequences,  $x_{2n-1}^D = \frac{3+c}{4}$  and  $x_{2n}^D = \frac{1-c}{4}$  (see Figure 8).

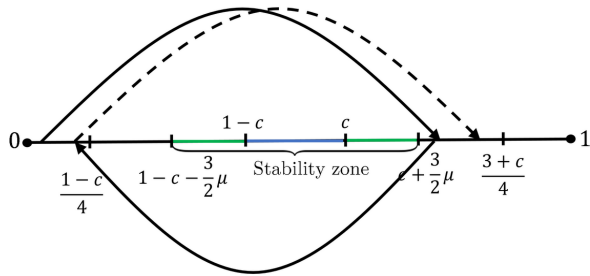


Figure 6. Dynamics of leaders positions when

$$\frac{4c+9\mu-4}{2} < x^D < \frac{1-c}{4}.$$

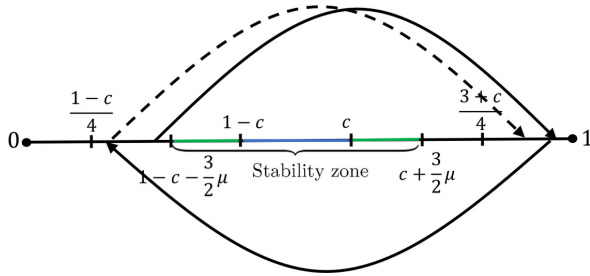


Figure 7. Dynamics of leaders positions when

$$\frac{1-c}{4} < x^D < 1-c-\frac{3\mu}{2}.$$

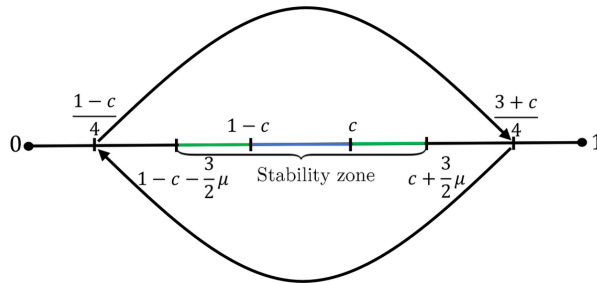


Figure 8. Dynamics of leaders positions when  $x^D = \frac{1-c}{4}$ .

## 2.3 Implications

The model allows us to formulate specific predictions about the outcomes of popular unrest in different countries as a function of their military capacity, the level of coordination costs and the legitimacy of the incumbent. The model allows for 8 qualitatively different outcomes in 2-period version of the model, as summarized in Table 1.

It is intuitively clear that there can be no successful protests, if the costs of collective action are high and the incumbent is not radical, so not many people are willing to take to streets (see proposition 3(i)). This result appears in our setup from the assumption that the citizens choose to protest each time when the expected new incumbent is better than the current leader.

Furthermore, if both costs of collective action and military capacity are low, there will be protests in two periods independently of the initial incumbent's position (see proposition 3(iii)). If the costs of coordination are low, but incumbent is not radical, or the costs of coordination are high, but the incumbent is radical, then the coherent protests might exist. In this case, if military capacity is high, all coherent protests are not successful. If military capacity is low,

**Table 1. Outcome as a function of Parameters**

<b>Theoretical parameter of the model</b>	$\mu = \frac{v}{\delta}$	$c$	$x^D$
<b>Empirical Proxy / Results</b>	<b>Military capacity</b>	<b>Inverse of Facebook penetration</b>	<b>Inverse of the legitimacy Index</b>
No significant protests	High	High	Not radical
	Low	High	Not radical
Significant protests, not overthrown	High	Low	Not radical
	High	High	Radical
Successful protest in 1 <sup>st</sup> period, new dictator is stable	High	Low	Radical
	Low	High	Radical
Protests in both periods	Low	Low	Radical
	Low	Low	Not radical

then protests will succeed. The diversity of possible outcomes is driven by the legitimacy of the current ruler: if the incumbent is radical, new incumbent will be not radical and vice-versa (see proposition 3(i, ii)).

### 3 Evidence

Though the careful econometric analysis is needed to further confirm our findings, the relatively new nature of social networks that permit the protests to occur as described in the model, and the multiplicity of possible outcomes, resulting from the influence of 3 distinct parameters, preclude us from the attempts to perform it. However, the Arab Spring provides an ample collection of episodes that involved the rapid emergence of protest movements, and, in case of a success, possible new protests. In this section, we juxtapose the events of the Arab Spring against the predictions of our model. For this purpose, we investigated the dynamics of popular protests in countries of Arab Spring and grouped them accordingly. We then compare how the observed dynamics of protest movements corresponds to the countries' values of  $c$ ,  $\mu$  and the position of the dictator. In this section, using the proxies, described below, we show, that the model predicts observed outcomes adequately. We later discuss specific cases, illustrating the most interesting combinations of the parameters in our model.

Table 2 presents the actual dynamics of the protests, as of December 2013.

The group “no significant protests” includes countries in which potential opponents of the regime have not overcome the collective action problem. For example, in Algeria and Djibouti the costs of collective action remained high, as these countries have very limited internet coverage

**Table 2. Arab Spring Countries by Type of Protests**

<b>Protests / Results</b>	<b>Country</b>
No significant protests	Algeria, Djibouti, Lebanon, Morocco, Oman, Iranian Khalifat
Significant protests, not overthrown ( <i>Continuing protests</i> )	Iraq, Jordan, Kuwait, Mauritania, Palestine, Saudi Arabia, Sudan, Syria, Bahrain, Yemen
Overthrown, protest stops ( <i>One-shot protests</i> )	N/A
Overthrown, protest persists ( <i>Multiple protests</i> )	Egypt, Tunisia

(12.5 and 6.5 percent of population, respectively), while Morocco and Oman, having high internet penetration (51 and 68 percent of population), have very low rates of Facebook penetration (8 percent in both countries). There is no country led by a radical incumbent that tolerates high internet or Facebook penetration, and thus there is no example of a country from the third group in Table 1 (the successful protest occurs, and the new incumbent is stable). In order to confirm, that the observed outcome is in line with the predictions of the model, we use the following proxies for the parameters of the model.

### 3.1 Proxies

Analyzing our main cases, we use the following proxies. *Individual costs of collective action*  $c$  are proxied by Facebook penetration within the country provided in the Arab Spring Social Media Report ("Social Media in the Arab World: Influencing Societal and Cultural Change?", 2012). The Facebook Usage Media Report (2011) suggests that Facebook and internet penetration are not perfectly correlated. In some countries such as Djibouti and Iraq, the Facebook penetration exceeds that of internet penetration, suggesting that people rely more on mobile access. Conversely, wide internet usage does not guarantee high Facebook penetration. Table A1 provides some illustrations (see Appendix).

We choose Facebook penetration, rather than internet coverage, as our proxy, as various studies suggest that it had a profound impact on facilitation of political collective action. Valenzuela, Arriagada, and Scherman (2012), studying the case of Chile, found that Facebook usage was significantly correlated with protest activity, even after taking into account political grievances, material, and psychological resources, values, and other news media usage. Furthermore, there is substantial evidence that Facebook was successfully used for coordination of the collective action (see, e.g., Pollack et al, 2011, Castells, 2012, Tufekci and Wilson, 2012). Youmans and York (2012) suggest that these technologies actually help autocratic governments to target the repressions against particular democracy advocates. However, the events of Arab Spring have

demonstrated that the ability to overcome the collective action problem during the unrest was more important than the participation of the particular activist in the uprising.

The disparity between the *incumbent policy position*  $|x^D - 1/2|$  and the median voter is proxied by the Legitimacy Index from Polity IV, where the greater index corresponds to lower legitimacy of the incumbent and his regime. Legitimacy is comprised of four sub-indexes: social legitimacy, security legitimacy, economic legitimacy, and political legitimacy, each of which can be interpreted as a proxy for the popular support of different aspects of incumbent's policy. Index's value equal to 1 corresponds to the policy that is perceived as legitimate by the majority of the population (and the median citizen). Thus, the legitimacy index can serve as a reasonable measure of the popular support of the incumbent. As we chose the countries of Arab Spring as an illustration for the model, our dataset does not include fully legitimate regimes. The choice of the legitimacy index as a proxy for the deviation from the preferred policy of the median citizen allows our study to distinguish the incumbent with a radical policy position from the autocratic ruler, who nevertheless conducts a policy close to the one preferred by the median citizen (cases of Morocco (legitimacy index 2) and Oman (legitimacy index 3)). High values (e.g., 12 in Sudan or 9 in Yemen) correspond to policies that are far from enjoying popular support.

We proxy *military capacity*  $\nu$  by the Global Militarization Index compiled by the Bonn International Center of Conversion.<sup>9</sup> The index juxtaposes a country's military expenditures with its Gross Domestic Product and health expenditures; it also takes into account the total number of military and paramilitary forces in the country relative to the number of physicians. Furthermore, it reflects the amount of heavy weaponry possessed by the country's armed forces. This approach allows us to account for the vast heterogeneity of Arab Spring countries with respect to wealth, size of population, and average living standards. In our exercise, we take the largest GMI value in the sample as 100 percent, and normalize all other countries accordingly.

It seems obvious that higher militarization helps the regime to secure its stability. However, our analysis suggests that with the arrival of a new technology that facilitates coordination, an incumbent cannot secure his position even with significant military resources. Furthermore, if the incumbent is radical, the new leader will emerge on the other side of the political spectrum, and might be as far from the median as his predecessor. Thus, low costs of coordination,

---

<sup>9</sup>Finding a suitable proxy for military capacity proved to be a challenging task: simple measures as the amount of military spending or number of military personnel per capita are not appropriate due to the substantial heterogeneity of Arab Spring countries with respect to wealth, population size, and territory. For example, Algeria, having relatively small expenditures on military as a percentage of GDP, preserves one of the most militarized economies in Africa.

together with low military capacity, may plunge the country into a cycle of protests. In this cycle, each new incumbent that triumphantly came to power as a result of a protest is likely to be overthrown, while each new incumbent represents the preferences of protesters on different sides of the political spectrum.

Table A2 contains data on the pre-Arab Spring legitimacy of the incumbent, Facebook penetration, and degree of militarization (see Appendix).

### 3.2 Analysis and results

Let us juxtapose Facebook penetration with the public support of the incumbent. First we will observe the general picture of protests in Arab Spring countries, and then investigate the case studies of Egypt, Tunisia, Kuwait and Algeria. Figure 9 presents Arab Spring countries in the space of our variables. The X-axis shows the incumbent’s departure from the preferred policy (proxied by Legitimacy Index of Polity IV). We use the value of index in the year prior to the start of unrest. For countries with no protests (Morocco, Oman, Djibouti) we use the index value in 2010.

Y-axis corresponds to the level of Facebook penetration (data from Arab Spring Social Media Report). The size of the bubble corresponds to the military capacity of the state by the Global Militarization Index.

The bubble color reflects the type that country belongs to: striped (no significant protest), light gray (continuing protest), and taupe (multiple protests). Libya is excluded from the classification and is marked white, because of the civil war and the international intervention.

Figure 9 is in line with our theoretical predictions. The countries with continuing protest that did not lead to the downfall of the incumbent are divided into two groups. The first group (Kuwait, Jordan, Lebanon, and Bahrain) has relatively moderate incumbent policy position and extremely high level of new media development. The reason why these countries are not “striped” is the military capacity of the government that can be used against protesters. Second group (Syria, Algeria, Saudi Arabia, Iraq, Yemen, and Mauritania) has governments that are more radical (so the incentives to protests are higher there), but are poor in terms of IT development. That is why in a country with small military capacity (such as Yemen) the protests did not lead to incumbent’s replacement.

There are two “multiple protests” countries in our sample: Tunisia and Egypt. It is useful first to compare them to each other, and than compare them to the closest countries from other groups.

Both Egypt had and Tunisia are quite moderate in terms of policy position of the incumbents at the initial stage of unrest. They also had (relatively to the most of the Arab Spring countries) low level of state military capacity. Finally, they have high level of Facebook penetration. Though at the initial stage of unrest, statistic agencies reported that FB penetration at Egypt was close to the median among all Arab countries level this value doubled in the following year.

The difference in the level of Facebook penetration (other parameters being comparable) provides clear example of the impact of the low costs of coordination on dynamics of protest. In terms of our model Tunisia is the country with extremely low level of  $c$  and  $\mu$  with predicted two-side protests. Egypt has higher costs of coordination with predicted one-side protests. As we describe in the case studies, that is exactly what is going on in the two countries.

Tunisia is relatively close to the first group of the "continuing protest" countries. Bahrain and Lebanon have the same level of incumbent radicalization, and higher level of FB penetration, but are much more militarized. The same is true for Jordan with lower level of radicalization of the incumbent. Though the Kuwaiti As Sabah ruling family has strong links with country's security services, Bonn International Center of Conversion reported the military capacity of the country as low (comparable to Egypt). The difference in political dynamics of these two countries can be explained by less radicalized position of Kuwait's incumbent and thus lower incentives to participate in protests.

Excluding the messy and unclear data (civil war, foreign intervention) and protests outcome in Syria and Libya, we can see that while second part of "continuing protest" countries has more radicalized incumbents, all of these countries are much more militarized and much less technologically developed. Mauritania and Yemen has comparable to Egypt's military capacity, but Facebook penetration there holds at the near-zero level. Finally, Saudi Arabia in 2010 was more developed in terms of IT (that was no longer true in 2011 and 2012), more radicalized but also more militarized than Egypt.

The general picture of Arab Spring protests is in line with our theoretical findings. We will now look closely at case studies, focusing on 4 countries: Tunisia, Egypt, Kuwait and Algeria.

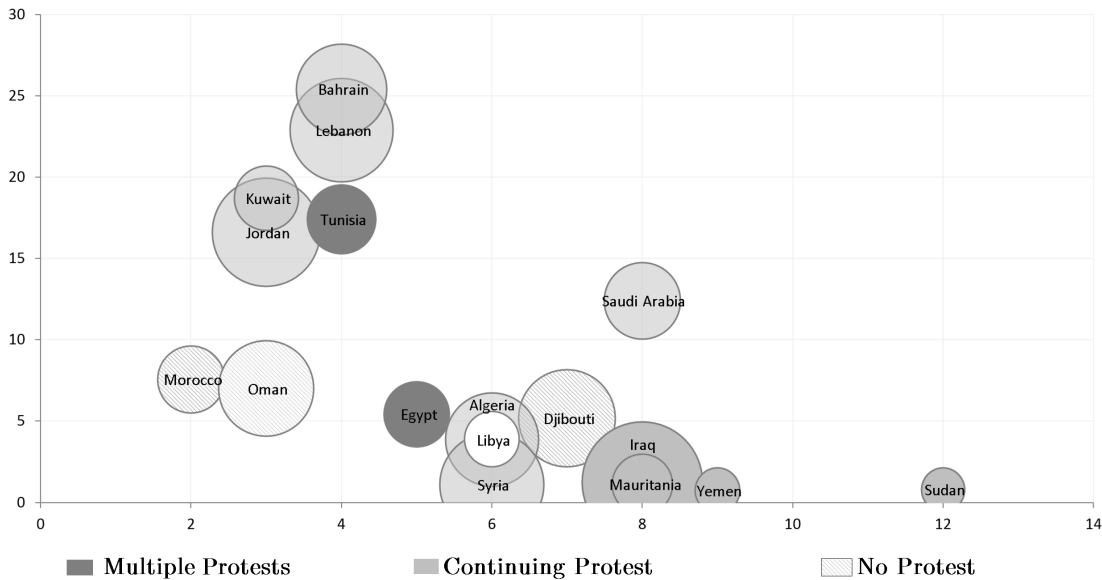


Figure 9. Legitimacy index (X-axis), Facebook penetration (Y-axis) and military capacity (size of bubble) in Arab Spring countries

Egypt and Tunisia are the countries that witnessed successful recurrent protests. They combine high internet/Facebook penetration with relatively low military capacity and a relatively moderate incumbent. In line with our theory, in Egypt, where the incumbent was relatively more radical, the protest was (each time) formed on one side of the political spectrum. In Tunisia, where the incumbent was less radical, protest emerged from both ends of the spectrum.

These parameters help us to interpret the difference in the dynamics of protest movements in Kuwait and Algeria, with both countries having high military capacity and relatively large support for the incumbent (in both cases, protests erupted over the economic agenda), but differing in the extent of the Facebook penetration.

Together, Algeria, Kuwait, and Egypt and Tunisia provide examples of three combinations of Facebook penetration, military capacity, and the radicalism of the incumbent: temporary protests, significant protests that do not result in a change of the incumbent, and recurrent successful protests against different incumbents.

### 3.3 Egypt

Since the outbreak of the Arab Spring, Egypt has been a prominent case of recurrent protests. The protest started on 25 January 2011 and continued for 16 days, during which time 6 million



Egyptians took to the streets. The camp at the Tahrir Square received much news coverage through social media, and thousands of people joined the protest, sharing their views and their experience through social networks. Lynch calls this uprising a “Facebook-driven revolution”, as “the protests largely bypassed formal political parties and institutions—including Islamist parties—and mobilized millions of citizens across a cross-section of society” (Lynch, 2011).

At the start of the protest Hosni Mubarak, Egypt’s leader since 1981, tried to stop the protest by using military forces, but the military declined to fire into the crowd. The next attempt to curb the protest was implemented with internet shutdown between January 25 and February 1, but it “only slowed, but did not stop, the flow of information out of Tahrir Square, as a small but technologically savvy group of protestors continued to disseminate information and videos” (Tufekci and Wilson, 2012). As political concessions such as dissolution of the parliament have not worked, President Mubarak had to resign.

Although Egypt’s Facebook penetration rate in January 2011 remained low, social networks played an important role in organizing the protest. Tufekci and Wilson surveyed protestors to find that “about 92% of the respondents used phones in general and 82% used phones for communicating about the protests (Table 3). About half had a Facebook profile (52%) and almost everyone who had one used it for communicating about the protests (51%). Twitter was used in general by 16% of the respondents, and for communicating about the protests by 13%” (Tufekci and Wilson, 2012).

In Tufekci’s and Wilson’s tables they provide it is easy to see that blogs, Facebook and phones were used for information sharing. Most importantly, this communication did not require face-to-face interaction to organize the attendance at the first day of the protest.

As Mubarak was ousted by the protestors, the transitional government was formed by the military with a promise of fair elections. The achievements of the government included the liberalization of laws, suspension of the State Security Investigations Service, and sacking of unpopular ministers. However, the elections, organized by the military, were considered fraudulent (“After Second Day of Voting in Egypt, Islamists Offer Challenge to,” *The New York Times*, November 29, 2011; “Egypt Elections Marred by Allegations of Fraud,” *Washington Post*, November 29, 2011) as Muhammad Morsi, a leader of the Islamic Brotherhood, came to power. His party played an important role during the first round of unrest, but its leaders prohibited the members to use the symbols or the slogans of the party. Thus, the new incumbent came from the Tahrir Square, while the military that came to his support were regarded as

**Table 3. Percent of Protestors in Egypt Using Different Media  
by Purpose and Gender**

Media	Use in General			For Communicating about protests		
	Male	Female	General	Male	Female	General
Blog	14	18	15	10	16	12
E-mail	83	85	83	25	44	27
Facebook	49	60	52	48	60	51
Phone	92	93	92	80	87	82
Print	64	59	63	59	52	58
Satellite TV	93	94	94	92	93	92
Text	61	67	62	46	49	46
Twitter	15	20	16	11	19	13
Observations	792	258	1050	792	258	1050

Source: Tufekci and Wilson (2012).

**Table 4. Impact of Media Use to Communicate About  
Protests on Participation in Protests**

Predictor	Attended protest on first day	Previously attended protests
Age	1.012	1.035***
Male	1.437*	1.13
Education	0.996	1.078
Internet at home	1.233	1.440*
Internet on phone	1.071	1.12
Blogs	1.574*	1.376
E-mail	1.313	1.154
Face-to-Face	1.214	0.613*
Facebook	1.411*	1.2
Phone	1.531*	1.158
Print	0.961	1.353*
Satellite TV	0.714	0.784
Text messaging	1.116	1.180*
Twitter	1.414*	1.235
Constant	0,140*	0.088***
Log-likelihood	-662.3	-639.839

Source: Tufekci and Wilson (2012).

heroes of Tahrir for the refusal to fire in the crowd ("How Hosni Mubarak Misread his Military Men," *The Guardian*, February 12, 2011). Liberals and leftists, who sided with members of the Islamic Brotherhood (but not with the party, as its name was not mentioned) against Mubarak, now accused it of purchasing military support (Castels, 2012). Youth, professionals and leftists played the crucial role in removing Mubarak from power, but they could not translate their influence into solid political outcomes.

The elections, proclaimed by the provisional government, introduced a new electoral rule that assigned 2/3 of the seats to be distributed by the proportional rule and 1/3 of the seats by bloc voting in two-seat constituencies, with the possibility of a run off ("How Does Egypt's Parliamentary Election System Work?" *Reuters*, 2011) This new system gave a significant tilt to the Islamic Brotherhood, as the other participants of anti-Mubarak unrest were new parties that had to resolve the "two-seat constituencies division" coordination problem in order to not compete with each other. They were too fractionalized to gain from the new system (Faris, 2012).

The second round of protests came after Morsis's accession to power. While the anti-Mubarak protests emerged in 2011, as the Facebook penetration of Egypt was still low, the new wave of protests occurred when the Facebook penetration reached 16.2% (which corresponds to growth of 300 percent for a year). The significant difference came from the role of military, which suppressed the first attempts of protests against the new incumbent. The main agenda of new (and continuing) unrest is the resentment towards the new constitution, drafted by Morsi.

As noted by Lang (2013), "SCAF [Supreme Council of the Armed Forces] stipulated that it was the only body that could legislate and govern, even after a new parliament had been elected. This ensured, according to some, that only a new president, presumably one that SCAF would support, would be able to govern effectively. The parliament, in other words, was to be severely limited in its ability to play a role in the government of Egypt, something which would curtail any real representative government."

Morsi, unlike Mubarak, was able to secure the support of the military at his accession to power, and thus was able to handle the protest for a year, while it took only 18 days to depose Mubarak. However, as the protest continued into July 2013, it sided with the protesters again, presenting Morsi with an ultimatum to meet the demands of millions of protesters in the streets seeking the new election. On July, 3<sup>rd</sup> Morsi was deposed, and the head of the Supreme Constitutional Court Adly Mansour was appointed as the provisional president. The Islamic Brotherhood, which had made up a large fraction of the anti-Mubarak Tahrir Square protesters

and the backbone of Morsi's rule, already withdrew its support of the government, that came to power as a result of the protests from the other side of political spectrum.

The loss of military support, together with falling costs of collective action (as millions of Egyptians are joining Facebook every year) suggests that the new incumbent, emerging from this new wave of protests, will represent the median preferences of the new protest, but will be too radical for the median preferences of the entire society, and, hence, is also likely to face some instability.

### 3.4 Tunisia

Tunisia provides another case from a group with successful change of the incumbent and recurrent protest against the new leader to illustrate how the low costs of collective action, low military capacity and moderate incumbent can ignite protests on the opposite sides of political spectrum, in accordance with Corollary 11 of the model.

The Tunisian Revolution, which ousted longtime President Zine El Abidine Ben Ali, started with a series of street demonstrations in January 2011. The protests began after a college-educated street vendor's (Mohamed Bouazizi's) self-immolation in the coastal town of Sidi Bouzid in despair at corruption and joblessness. The demonstrations were an expression of citizens' frustration over economic issues like food inflation and high unemployment, as well as a lack of political freedoms like freedom of speech ("Tunisia: Time of Change, Suicide that Sparked a Revolution," *Al-Jazeera*, January 20, 2011). Before Ben Ali's replacement the number of protestors reached more than 100,000. Of the 19 political parties and movements in Tunisia, 13 supported the protests. There were representatives from all parts of the traditional political spectrum including secularists (Democratic Forum for Labour and Liberties, Republican Party), Liberals and Social Liberals (Ettajdid Movement, Social Liberal Party, Congress for the Republic, Maghrebi Republican Party), socialists (Movements of Socialist Democrats, Unionist Democratic Union, Worker's Party), nationalists (Ba'ath Movement), and Islamists (Hizb-ut-Tahrir, Enhanda Movement).

Twenty-eight days later on 14 January 2011 the President, after 23 years in power, officially resigned. The Constitutional Court affirmed Fouad Mebazaa as acting president under Article 57 of the Constitution and allowed him to create a caretaker coalition government. The almost immediate resignation of newly appointed ministers who were not members of the Constitutional Democratic Rally (the party supported Ben Ali) ignited a new wave of protest, that continued into October 2011. As the elections for the Constituent Assembly gave the Islamist Ennahda

Party the plurality of seats, the "Ennahda" formed a coalition with the centre-left Congress for the Republic and the left-leaning Ettakatol as junior partners. Hamadi Jebali ("Enhanda") became Prime-Minister respectively, while Moncef Marzouki obtained the Presidency - the second most powerful role after the prime minister.

During 2011-2013, Tunisia has seen four prime-ministers: Mohamed Ghannouchi, who formed a provisional government, but was ousted from office after a month of being in power. He was succeeded by Beji Caid el Sebsi, who has successfully overseen elections and stepped down as Hamadi Jebali, an Islamist leader, has won the election. As in the case of Egypt, the new incumbent represented the median preferences of the protesters, but was too radical for the median preferences of the whole country.

After the Ben Ali resignation most of the protesters participated in the Constitutional Assembly elections on October 23. For many people, the results were unexpected. The moderate Islamist Enhanda party was supported by 37% of voters and got 89 out of 217 places in parliament. Congress for the Republic received 29 seats. The coalition of these parties formed the new government.

But the ongoing economic problems and, at the same time, a moderate government position led to a new wave of protests. On the one hand, the coalition with a secularist party forced "Enhanda" to not implement pro-Islamist policies. This was negatively perceived by salafists, a radical faction of Islamic movements (like Ansar al-Shariah), who launched a series of new protests and announced the establishment of a "New Emirate" in Srdjan. On the other hand, the murder of one of leaders of the secularist Democratic Patriot's Movement Chokri Belaid triggered opponents of Islamization to take to the streets again. The cabinet of Hamadi Jebali faced a new round of protest rallies, after the death of the anti-Islamist protester, and ultimately led to Hamadi Jebali resignation from his position on March 14.

Ali Laarayedh became the new prime-minister, and formed his cabinet chiefly from the Ennahda Movement, this time, however, adding independent secular politicians to the key minister positions. Nonetheless, the new prime-minister faced a new wave of protests by the Tamarod movement. As the anti-Mosi protests in Egypt succeeded in ousting him from power, the members of Tunisian movement called for mass protests after quickly gathering the signatures of about 200,000 people opposing the government. The protests unfolded in early July.

The main difference between Tunisian and Egyptian protests lies in the political position of the protesters. The Egyptian Morsi was more radical on the political spectrum, thus the protesters were concentrated on t one end of the spectrum, in full accordance with Proposition

1 of the model. In Tunisia, however, the Ennahda is much closer to the center of the spectrum, and thus, faces the protest both from salafists groups who advocate greater islamization, and secularists and liberals, represented by Tamarod, which is again in accordance with Proposition 1.

### **3.5 Kuwait**

The Kuwaiti society is markedly different from many others in the sense that a large portion of the country's population is not regarded as citizens and lack many civil rights and privileges provided by the incumbent. In November 2011 the Kuwaiti Emir Sabah Al-Ahmad Al-Jaber Al-Sabah distributed the grants of approximate value of 3600\$ to the citizens, which meant that a significant fraction of the population were excluded from the event, thus provoking the protest among Bedouins. However, it was rapidly supported by various fractions of the population. The movement proved to be sufficiently threatening to Emir and forced the resignation of the Prime Minister. In order to keep control over the situation the Emir agreed to hold parliamentary elections. The elections were carried by the opposition, but the Constitutional Court declared them illegal. The former pro-government Parliament was promptly reinstated, which provoked a new protest rally that was suppressed by large-scale military involvement.

The next attempt to hold elections was boycotted by the opposition, thus resulting in a victory of pro-government parliament. Thus, the incumbent managed to maintain the control over the country, but not to tame the protesters, and the protests persist. The endurance of the protest movement is not associated with an involvement of a particular leader or party. Rather, it is fueled through the social media that permeate Kuwaiti society.

The Facebook membership, for instance, exceeds 35% of population (which is one of the highest levels in Arab World), while internet penetration amounts to 74%, making the coordination of the protest movement remarkably cheap. However, the incumbent possesses sufficient military capacity that secures his position in office, given the Kuwait supports one of the highest defense spending rates per capita in the world. The combination of these factors might not be sufficient to ensure the stability of the position of government leadership in case the incumbent was very radical and provoked the desire to change the leadership among too many citizens. The Legitimacy Index, however, suggests, that the incumbent is not deemed very radical, given substantial military capacity, the protest is not successful.

Thus, the combination of the wide Facebook penetration, high military capacity and relative mildness of the dictator suggest that the protests will not succeed, but will not cease either,

which is consistent with the propositions of our model, summarized in Table 1.

### 3.6 Algeria

Before addressing the case of Algeria it is worthwhile to mention that the country's background includes a history of violent uprisings in 1991 that cost many lives, and which in eyes of many citizens gave the government the mandate to fight the protests. Moreover, during the subsequent 15-year period Algeria lived in a state of emergency, which made any civil protests unlawful.

Despite the prohibition, the protest emerged in December 2010, amid the rapid spread of unrest in neighboring countries. Initially the anti-government movement formed around the economic agenda, as people reacted to rapid growth of food prices. The important fact is that they were not aimed at the replacement of the incumbent, but rather at obtaining wider civil rights and improving the economic situation in the country. While the protesters actively employed internet and social media, their coverage in Algeria is not very large: only 13.3% of population had internet access, thus the new technology did not become the facilitator of the large-scale coordinated antigovernment action.

Probably that was one of the main reasons for the emergence of the common platform for the coordination of opposition movement. Despite the fact that the protest was not associated with any particular party or union, many of them joined the unrest. The coordination effort did not yield much: the resolutions, carried through this body, did not suggest any particular measures, but rather stressed the need for democratization and greater equality.

The incumbent responded to protest activity by lifting the state of emergency, that lasted for 15 years and replacing it with milder anti-terrorist laws, lowering food prices, and the creation of an anti-protest police. The latter fought every anti-government action, with the police force exceeding that of protesters by 2 or 3 times. Its emergence hastened the decline of the protest movement in Algeria to the extent that the protest did not resume even after the fraudulent parliamentary elections-a common trigger for protest movements.

The cessation of the uprisings is not very surprising, given the large military capacity to fight protest activity and the nature of the unrest that started for primarily economic reasons. Thus, in accordance with the predictions of the model, the combination of low Facebook penetration, high military capacity, and relative mildness of the dictator leads to the inability of the citizens to overcome the problem of collective action. However, the interesting insight comes from the comparison of Algerian case with Kuwaiti protests that were summarized earlier. One major difference between these countries comes from the extent of internet penetration, which is high

for Kuwait, but low for Algeria. This dissimilarity marks the variation between the countries of the first and second groups according to our framework, as discussed in Proposition 2 of the model.

## 4 Conclusion

As the social media spread into non-democratic countries, it allowed the citizens who were dissatisfied with the performance of the current incumbent to coordinate. The coordination through social media is essentially costless, so no special organizations, such as political parties are needed to facilitate it. Thus, citizens with potentially different preferences over policies can agree to participate in unrest, correctly assuming that other participants in the protest are more similar to them in their political preferences than the current incumbent. If the unrest was successful and led to government change, the new incumbent would be elected from the crowd of protesters. Our framework helps to interpret the dynamics of the protest in non-democratic countries with different combinations of military capacity, social media penetration, and the extent of the radicalization of the dictator. The most interesting case arises when a leader, who gained popular support during the protests, emerges as a new incumbent: given the costs of collective action remain low, he becomes vulnerable to popular protest.

The distinct feature of our study is the set of assumptions that underlie the model. For instance, we assume that the incumbent cannot credibly commit to any political platform other than his own bliss point, which is a common assumption. We also assume, that the incumbent cannot influence the spread of social networks. This assumption, while quite strong, is consistent with many empirical studies, cited above. The current Incumbent is also powerless in changing the extent of his military support. This assumption comes from the observation, that newly expanded military support of the ruler easily defected to the opposition during multiple events of Arab Spring. Also, we do not assume the division of the society into well-defined groups with different costs of participation in protests, thus assuring, the diversity of protesters in full consistence with empirical studies of protest movements during the Arab Spring.



## References

- Acemoglu, Daron and Robinson James** (2001) "A Theory of Political Transitions," *American Economic Review*, 91(4): 938–963.
- Acemoglu, Daron and Robinson James** (2006) "Economic Backwardness in Political Perspective," *American Political Science Review*, 100(01): 115–131.
- Aker, Jenny C, Paul Collier, and Pedro Vicente** (2013) "Is Information Power? Using Mobile Phones and Free Newspapers During an Election in Mozambique," Center for Global Development Working Paper (May): 1–60.
- Andra, Christine, et al** (2012) "Annual Report of Bonn International Center of Conversion," Bonn International Center of Conversion, Bonn.
- Bailard, Catie Snow** (2012) "A Field Experiment on internet's Effect in an African Election: Savvier Citizens, Disaffected Voters, or Both?" *Journal of Communication*, 62(2): 330–44.
- Barany, Zoltan** (2011) "Comparing the Arab Revolts: The Role of The Military," *Journal of Democracy*, 22(4): 28-39
- Bueno de Mesquita, Bruce, Alastair Smith, Randolph Siverson, and James Morrow** (2005). *The Logic of Political Survival*. MIT Press Books.
- Bueno de Mesquita, Bruce and Alastair Smith** (2011) *Dictator's Handbook*, New York: PublicAffairs.
- Campante, Filipe R, Ruben Durante, and Francesco Sobbrío** (2013) "Politics 2.0: The Multifaceted Effect of Broadband internet on Political Participation," *Harvard Government Working Paper Series*
- Castells, Manuel** (2012) *Networks of Outrage and Hope: Social Movements in internet Age*, Cambridge, UK.
- Diamond, Larry and Marc F Plattner** (2012) *Liberation Technology: Social Media and the Struggle for Democracy*. JHU Press.
- Drago, Francesco and Francesco Sobbrío** (2013) "Meet the Press: How Voters and Politicians Respond to Newspaper Entry and Exit ," *IZA: Discussion Paper Series*.
- Egorov, Georgy, Sergei Guriev, and Konstantin Sonin** (2009) "Why Resource-Poor Dictators Allow Freer Media: A Theory and Evidence from Panel Data," *American Political Science Review*, 103(4): 645-668.
- Enikolopov, Ruben, Maria Petrova, and Ekaterina Zhuravskaya** (2011) "Media and Political Persuasion: Evidence from Russia," *American Economic Review* 101(7): 3253–85.
- Facebook Usage Report: Factors and Analysis (2011)

- Faris, David** (2012) "Constituting Institutions: The Electoral System in Egypt," *Middle East Policy* 19(1): 140–54.
- Geddes, Barbara** (2007). What Causes Democratization. *The Oxford Handbook of Comparative Politics*. Oxford: Oxford University Press.
- Geddes, Barbara, Joseph Wright, and Erica Frantz** (2012). Autocratic Regimes. Manuscript. <http://www.personal.psu.edu/jgw12/blogs/josephwright/pp7.pdf>.
- Gentzkow, Matthew, Jesse Shapiro, and Michael Sinkinson** (2009) "The Effect of Newspaper Entry and Exit on Electoral Politics," *American Economic Review*, 101(7): 2980-3018.
- Gerber, Alan, Dean Karlan, and Daniel Bergan** (2009) "Behavior and Political Opinions Does the Media Matter? A Field Experiment Measuring the Effect of Newspapers on Voting Behavior and Political Opinions," *American Economic Journal: Applied Economics*, 1(2): 35-52.
- Gibbon, Edward** (1776) *The History of the Decline and Fall of the Roman Empire*, W. Strahan and T. Cadell.
- Ginkel, John, and Alastair Smith** (1999). So You Say You Want a Revolution: A Game Theoretic Explanation of Revolution in Repressive Regimes. *Journal of Conflict Resolution*, 43(3), 291–316.
- Hackett, James** (2010) *The Military Balance 2010: The Annual Assessment of Global Military Capabilities and Defense Economics*, London: The International Institute for Strategic Studies.
- Howard, Marc and Philip Roessler** (2006) "Liberalizing Electoral Outcomes in Competitive Authoritarian Regimes," *American Journal of Political Science*, 50(2): 365–381.
- Iskander, Elizabeth** (2011) "Connecting the National and the Virtual: Can Facebook Activism Remain Relevant After Egypt's January 25 uprising?" *International Journal of Communication*, 5: 13–15.
- King, Gary, Jennifer Pan, and Margaret Roberts** (2013) "How Censorship in China Allows Government Criticism but Silences Collective Expression," *American Political Science Review*, 102(2): 326-343.
- Kricheli, Ruth, Yair Livne, and Beatriz Magaloni** (2011) "Taking to the Streets Theory and Evidence on Protests Under Authoritarianism," APSA 2010 Annual Meeting Paper.
- Kuran, Timur** (1989) "Sparks and Prairie Fires: A Theory of Unanticipated Political Revolution." *Public Choice*, 61(1): 41–74.
- Kuran, Timur** (1991) "Now Out of Never: The Element of Surprise in the East European Revolution of 1989." *World Politics* 44(01): 7–48.
- Lang, Anthony** (2013) "From Revolutions to Constitutions: The Case of Egypt," *International*

*Affairs*, 89(2): 345–63.

**Lorentzen, Peter** (2013). China's Strategic Censorship. *American Journal of Political Science*. forthcoming

**Lotan, Gilad, et al** (2011) "The Revolutions Were Tweeted: Information Flows During the 2011 Tunisian and Egyptian Revolutions," *Web Ecology Project*, 5: 1375–1406.

**Lohmann, Susanne** (1993) "Information Aggregation Through Costly Political Action," *American Economic Review*, 84(03): 518–530.

**Lohmann, Susanne** (1994) "The Dynamics of Informational Cascades," *World Politics*, 47(1): 42–101.

**Lynch, Marc** (2011) "After Egypt: The Limits and Promise of Online Challenges to the Authoritarian Arab State," *Perspectives on Politics*, 9(02): 301–310.

**Magaloni, Beatrice** (2006). *Voting for Autocracy: Hegemonic Party Survival and Its Demise in Mexico*. Cambridge University Press New York.

**Meirowitz, Adam and Joshua Tucker** (2013) "People Power or a One-Shot Deal? A Dynamic Model of Protest," *American Journal of Political Science*, 57(2): 478–490.

**Miller, Laurel, Jeffrey Martini, and Stephen Larrabee** (2012) *Democratization in the Arab World. Democracy without Democrats*, IB Tauris, London.

**Miner, Luke** (2012) "The Unintended Consequences of internet Diffusion: Evidence from Malaysia" Working Paper, New Economic School

**Ostrom, Elinor** (2009) "Collective Action Theory," In: Oxford Handbook of Comparative Politics, 186–208.

**Pierskalla, Jan, and Florian Hollenbach** (2013) "Technology and Collective Action: The Effect of Cell Phone Coverage on Political Violence in Africa," *American Political Science Review*, 107(02): 207–224.

**Pollack, Kennet et al.** (2011) *The Arab Awakening: America and the Transformation of the Middle East*, Brookings Institution Press.

**Sikk, Allan** (2006) *Highways to Power: New Party Success in Three Young Democracies*, Tartu University Press.

*Social Media in the Arab World: Influencing Societal and Cultural Change?* (2012) Social Media Report, 2(1), 1–29.

**Spoerri, Marlene** (2008) "Uniting the opposition in the run - up to electoral revolution – Lessons from Serbia 1990 – 2000," *Totalitarismus und Demokratie*, 5(2005): 67–85.

**Svolik, Milan** (2009). Power Sharing and Leadership Dynamics in Authoritarian Regimes.

*American Journal of Political Science*, 53(2), 477–494.

**Svolik, Milan** (2012). *The Politics of Authoritarian Rule*. Cambridge University Press.

**Tilly, Charles and Sidney Tarrow** (2006) *Contentious Politics*, Oxford University Press.

**Tufekci, Zeynep and Christian Wilson** (2012) "Social Media and the Decision to Participate in Political Protest: Observations From Tahrir Square," *Journal of Communication*, 62(2): 363–379.

**Valenzuela, Sebastian, Arturo Arriagada, and Andres Scherman** (2012) "The Social Media Basis of Youth Protest Behavior: The Case of Chile," *Journal of Communication*, 62(2): 299–314.

**Ware, Lewis** (1985) "The Role of the Tunisian Military in the Post-Bourgiba Era." *The Middle East Journal*, 27–47.

**Weinstein, Jeremy** (2007) *Inside Rebellion: The Politics of Insurgent Violence*. Cambridge University Press.

**Youmans, William and York, Jillian** (2012) "Social Media and the Activist Toolkit: User Agreements, Corporate Interests, and the Information Infrastructure of Modern Social Movements," *Journal of Communication*, 62(2): 315–329.

## 5 Appendix

In this appendix we consider formally in details the dynamics of the model. First, we prove formally the results concerning 2 periods model. We begin with several helpful observations.

**Proposition 5** Let  $x^D \in [0, 1 - c)$  and  $x^P = \frac{1}{3}(x^D + 2 + c)$ . Then

- 1) if  $x^D < \frac{1-c}{4}$ , then  $x^P < \frac{3+c}{4}$ ;
- 2) if  $x^D = \frac{1-c}{4}$ , then  $x^P = \frac{3+c}{4}$ ;
- 3) if  $x^D > \frac{1-c}{4}$ , then  $x^P > \frac{3+c}{4}$ .

**Proof.** Compare  $x^P = \frac{1}{3}(x^D + 2 + c)$  and  $\frac{3+c}{4}$ . It's easy to see that

$$x^P \vee \frac{3+c}{4} \Leftrightarrow x^D \vee \frac{1-c}{4},$$

where  $\vee \in \{>, <, =\}$ .

**Proposition 6** Let  $x^D \in [0, 1 - c)$  and  $x^P = \frac{1}{3}(x^D + 2 + c)$ . Then  $1 > x^P > c$ .

**Proof.** Check the first inequality:

$$\frac{1}{3}(x^D + 2 + c) < 1 \Leftrightarrow x^D + 2 + c < 3 \Leftrightarrow x^D < 1 - c.$$

The latter is true by the assumptions of the proposition. The second inequality follows from the inequality  $c < 1$  and the following equivalent transformations:

$$\frac{1}{3}(x^D + 2 + c) > c \Leftrightarrow x^D + 2 + c > 3c \Leftrightarrow x^D > 2c - 2.$$

Denote by  $R(x)$  the distance of the point  $x$  from the median citizen, so that  $R(x) = |x - \frac{1}{2}|$ . The next proposition follows from the proposition 5.

**Proposition 7** *Let  $x^D \in [0, 1 - c)$  and  $x^P = \frac{1}{3}(x^D + 2 + c)$ . Then*

- 1) if  $x^D < \frac{1-c}{4}$ , then  $R(x^D) > R(x^P)$ ;
- 2) if  $x^D = \frac{1-c}{4}$ , then  $R(x^D) = R(x^P)$ ;
- 3) if  $x^D > \frac{1-c}{4}$ , then  $R(x^D) < R(x^P)$ .

The same logic can be applied to the protest from the left side.

**Proposition 8** *Let  $x^D \in (c, 1]$  and  $x^P = \frac{1}{3}(x^D - c)$ . Then  $0 < x^P < 1 - c$ .*

**Proposition 9** *Let  $x^D \in (c, 1]$  and  $x^P = \frac{1}{3}(x^D - c)$ . Then*

- 1) if  $x^D < \frac{3+c}{4}$ , then  $R(x^D) < R(x^P)$ ;
- 2) if  $x^D = \frac{3+c}{4}$ , then  $R(x^D) = R(x^P)$ ;
- 3) if  $x^D > \frac{3+c}{4}$ , then  $R(x^D) > R(x^P)$ .

From propositions 6-9 one can conclude how radical is the new incumbent in comparison with the previous one.

Back to 2-periods interaction, in case of high cost of collective action  $c > \frac{1-3\mu}{2}$ , we have to compare the border of the stability zone and the points  $\frac{1-c}{4}$ ,  $\frac{3+c}{4}$ . It is easy to check that

$$1 - c - \frac{3}{2}\mu > \frac{1-c}{4} \Leftrightarrow c < 1 - 2\mu.$$

Thus, we have two different cases.

Case 1:  $c > 1 - 2\mu$ . Here we have  $1 - c - \frac{3}{2}\mu < \frac{1-c}{4}$ . If  $x^D \in (1 - c - \frac{3}{2}\mu, \frac{3\mu}{2} + c)$ , there are no successful protests against the incumbent. If  $x^D \in [0, 1 - c - \frac{3}{2}\mu]$  or  $x^D \in [\frac{3\mu}{2} + c, 1]$ , the new incumbent will be located in the zone of incumbent stability due to proposition 5. Hence, 2 scenarios are possible: there would be no protests at all or the single protest would occur in the period one.

Case 2:  $1 - 2\mu > c > \frac{1-3\mu}{2}$ . In this case  $1 - c - \frac{3}{2}\mu > \frac{1-c}{4}$ . If  $x^D \in (1 - c - \frac{3}{2}\mu, \frac{3\mu}{2} + c)$ , then again there are no successful protests against the incumbent. Let us find the point  $x$ , such that  $\frac{1}{3}(x + c + 2) = c + \frac{3\mu}{2}$  (i.e.,  $x$  is such incumbent, that his successor is on the border of the stability zone). It is easy to derive from the latter equality that  $x = \frac{4c+9\mu-4}{2}$ . Consequently, if  $x^D \in [0, \frac{4c+9\mu-4}{2})$ , or  $x^D \in (\frac{6-4c-9\mu}{2}, 1]$ , a single protest occurs in period 1. If  $x^D \in [\frac{4c+9\mu-4}{2}, 1 - c - \frac{3}{2}\mu]$  or  $x^D \in [c + \frac{3}{2}\mu, \frac{6-4c-9\mu}{2}]$ , the incumbent is overthrown in the first period, but the new protest occurs against the new incumbent, and he is also overthrown in the second period.

Finally, if the costs of collective action are low ( $c < \frac{1-3\mu}{2}$ ), then there are no stability zones and there always will be two periods of successful protests.

Next we prove formally the limiting properties of the model.

**Proposition 10** *Let  $x_n$  be uniquely defined, and suppose that it does not stabilize after first two periods. Then  $y_n \rightarrow \frac{1-c}{4}$  and  $z_n \rightarrow \frac{3+c}{4}$ .*

**Proof.** Compute the formula for  $y_n$  and  $z_n$ . Taking into account expressions for the expected new incumbent's position, we get that if  $n \geq 2$ , then

$$y_n = \frac{1}{3}(z_{n-1} + 2 + c) = \frac{1}{3}\left(\frac{1}{3}(y_{n-1} - c) + 2 + c\right) = \frac{1}{9}y_{n-1} - \frac{2}{9}c + \frac{2}{9}.$$

Consequently,

$$y_n = \frac{1}{9^{n-1}}y_1 + \left(\frac{2}{9} - \frac{2}{9}c\right)\left(1 + \frac{1}{9} + \dots + \frac{1}{9^{n-2}}\right) = \frac{1}{9^{n-1}}y_1 + \frac{1-c}{4} \rightarrow \frac{1-c}{4}.$$

Due to propositions 7 and 9, for each  $n \geq 1$  the inequalities  $R(y_n) > R(z_n) > R(y_{n+1})$  hold. Since  $y_n \rightarrow \frac{1-c}{4}$ , then  $z_n \rightarrow 1 - \frac{1-c}{4} = \frac{3+c}{4}$ .

**Table A1. Facebook users as a percent of population**

<b>Country</b>	<b>Internet penetration</b>	<b>Facebook penetration</b>
UAE	75	45
Israel	63	43
Bahrein	53	34
Qatar	40	34
Lebanon	24	23
Kuwait	37	21
Tunisia	34	18
Jordan	26	17
Saudi Arabia	38	12
Palestine Authority	32	11
Marocco	41	2
Oman	52	2
Egypt	24	5
Djibouti	3	5
Algeria	13	4
Libya	6	4
Iraq	1	1
Mauritania	2	1
Syria	20	1
Comoros	4	1
Sudan	9	1
Yemen	10	1
Iran	11	0

Source: Facebook Usage: Factors and Analysis (2011).

**Table A2. Country Parameters**

<b>Country</b>	<b>Legitimacy</b>	<b>Facebook Penetration</b>	<b>Militarization</b>
Iran	8	1.00%	68%
Algeria	6	3.80%	75%
Djibouti	7	5.00%	64%
Lebanon	4	22.86%	73%
Morocco	2	7.56%	72%
Oman	3	6.90%	79%
Qatar	4	12.00%	65%
Bahrain	4	23.21%	78%
Iraq	8	5.00%	66%
Jordan	3	16.54%	87%
Kuwait	3	18.23%	82%
Mauritania	8	1.15%	63%
Saudi Arabia	8	11.99%	79%
Yemen	9	0.73%	66%
Sudan	12	0.78%	.
Egypt	5	5.40%	70%
Tunisia	4	17.39%	50%

Source: "Facebook Usage: Factors and Analysis" (2011).