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Revolution empirics: predicting the Arab Spring

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Abstract

The paper examines whether the Arab Spring phenomenon was predictable by complete elimination in the dispersion of core demands for better governance, more jobs and stable consumer prices. A methodological innovation of the Generalized Methods of Moments is employed to assess the feasibility and timing of the revolution. The empirical evidence reveals that from a projection date of 2007, the Arab Spring was foreseeable between 2011 and 2012. The paper contributes at the same time to the empirics of predicting revolutions and the scarce literature on modeling the future of socio-economic events. Caveats and cautions are discussed.

1. Introduction

The unending Arab Spring has raised concerns in policymaking and academic circles (Khandelwal & Roitman, 2012). Egypt is facing a serious political dilemma: the conception and definition of democracy in the country has been revisited and revised in many instances with the erosion of investor confidence and the country is facing critical economic challenges. The recent presidential elections and ratification of a new constitution have led to a quasi-military regime. In Tunisia, the democratic transition has failed blatantly and there are continuous waves of social disruptions and political assassinations that are significantly affecting economic activity. The law of the land in Libya is determined by armed groups that ousted Colonel Muammar Gaddafi, tribal tensions are high and the new authorities are worried about prospects of stabilization because they can neither disarm nor control old and new armed groups originating from the anti-Gaddafi rebellion. Yemen's revolutionary movement that achieved its first victory with the ousting of President Ali Abdullah Saleh is also facing serious transition problems as regional insurgencies and daunting economic threats are squandering the opportunity of repairing Yemen's failing socio-political contract (Thiel, 2012). The situation in Syria is a humanitarian catastrophe and neither side of the battle is winning the war nor are they willing to enter into talks for a political settlement without preconditions. In light of the above, the immediate short-term effects of the Arab Spring have not been appealing.

Against this background, a substantial number of qualitative studies have recently examined the causes, consequences, trends and circumstances leading to the Arab Spring. Inter alia, they include: a chain of foreign affairs assessments (Anderson, 2011; Goldstone, 2011; Doran, 2011; Shehata, 2011; Blyth & Taleb, 2011; Hamid, 2011); the role of social media (Howard et al., 2011; Stepanova, 2011; Khondker, 2011) and economic consequences (Khandelwal & Roitman, 2012; Quilter-Pinner & Symons, 2013). Despite this growing body

of literature, we still know very little about the extent of predictability of the Arab Spring. The concern as to whether the phenomenon was foreseeable has remained an empirical challenge and a debate in academic and policymaking circles (Gause, 2011). Maybe timely socio-economic, institutional and political reforms might have been adopted by affected countries to mitigate unappealing short-term effects had the uprising been predictable. The purpose of the present study is to examine this assertion.

The intuition motivating a study on the Arab Spring predictability is typically consistent with the cross-country income catch-up and convergence literature that has been investigated and extensively documented in the context of neoclassical growth models and recently extended to other fields of economic development (Solow, 1956; Swan, 1956; Baumol, 1986; Barro, 1991; Mankiw et al., 1992; Barro & Sala-i-Martin, 1992, 1995; Fung, 2009 ; Mayer-Foulkes, 2010; Narayan et al., 2011; Bruno et al., 2012; Asongu, 2013a; Andrés & Asongu, 2013). Hence, reporting facts even in the absence of a formal theoretical model is not a useless scientific activity. In essence, applied econometrics should not be limited to the simple empirical exercise of either refuting or validating economic theories (Costantini & Lupi, 2005; Narayan et al., 2011).

In light of the above, it is reasonable to expect a general chaos after a complete mitigation of dispersion in factors that cause socio-political unrest for the two main reasons. *First,* evidence of convergence in deplorable politico-economic conditions implies that countries of poor governance standards are catching-up with their counterparts of very poor governance. *Second,* full catch-up indicates that cross-country politico-economic differences are absent, so that any spark of protest or revolution in one country can easily spread across borders. In other words, the possibility of cross-country revolution is completely harmonized with a timeline contingent on the period of full catch-up (Andrés & Asongu, 2013; Asongu, 2013b).

The unappealing signals that could incite social unrest used in the study include: poor governance (political, economic and institutional), unemployment and consumer price inflation. A recent methodological innovation in the estimation of *beta*-convergence is employed. The paper contributes to the literature in two key ways. *First,* it builds on the empirics of predicting revolutions and the scarce empirical literature on modeling the future of socio-economic events. *Second,* much of the empirical studies on the Arab Spring uprising have been exploratory in nature or mostly focused on the impact of political instability on macroeconomic and structural variables (Aisen & Veiga, 2006; Anderson, 2011; Goldstone, 2011; Khandelwal & Roitman, 2012; Quilter-Pinner & Symons, 2013; Thiel, 2012; Aisen and Veiga, 2013). We fill this gap by providing the first empirical assessment on whether forecasting the timing of the Arab Spring was feasible.

The rest of the paper is organized as follows. Section 2 briefly reviews existing literature and discusses the motivation for the empirics. The data and methodology are covered in Section 3. Section 4 presents the empirical analysis, discussion of results and policy implications. We conclude with Section 5.

2. Review of literature and motivation for the empirics

The purpose of this section is twofold. *First* it provides a summary of the literature on the causes, trends, consequences and circumstances leading to civil unrest in the Arab region in the recent past. *Second,* it highlights the key features of the convergence theory which underpins the argument in this paper.

2.1 Brief literature Survey

A substantial amount of qualitative studies has recently examined the causes, trends, consequences and circumstances leading to the Arab Spring. For instance, Anderson (2011) has demystified the Arab Spring by parsing the differences between Tunisia, Egypt and Libya. The weakness and resilience in Middle Eastern autocracies have been exhaustively discussed

by Goldstone (2011) to improve a general understanding of revolutions, while Hamid (2011) has been more concerned about the rise of Islamists and how they would influence politics and vice versa. An assessment of the beneficiaries of the second Arab revolution has also been provided by Doran (2011), while Shehata (2011) has discussed how Mubarak's reign came to an end in Egypt. Blyth & Taleb (2011) provide a more global outlook by assessing how suppressing volatility makes the world less predictable and more dangerous.

The role of social media in the Arab Spring has also received much scholarly attention. Howard *et al* (2011) analyzed over 3 million tweets and gigabytes on YouTube content and thousands of blog posts to establish that social broadcasting played a critical role in shaping the political debates of the revolution. Stepanova (2011) came to the same conclusion but advocated some caution on generalization: reservations about the applicability of any direct lessons' to other sociopolitical and regional contexts. The suppositions of the first-two authors are supported by Khondker (2011) with an addition that the absence of an open media and civil society in Arab countries prior to the Spring was a factor in itself in the social and political consequences of the new media.

As far as we are aware, the few quantitative papers that have investigated the phenomenon have been exploratory in nature, discussing correlations not causalities (Khandelwal & Roitman, 2012; Quilter-Pinner & Symons, 2013). Khandelwal & Roitman (2012) have examined comparable historical episodes of political instability in order to derive medium- and near-term economic implications. They have concluded that recent economic progress in the Middle East and North African (MENA) countries in transition is unfolding along lines of past episodes of political instability, a sluggish recovery in the medium-term and a sharp deterioration of macroeconomic variables. In light of these challenges, Quilter-Pinner & Symons (2013) provide recommendations for the United Kingdom (UK) on reforms to promote more inclusive and stable growth vis-à-vis inter alia the transition countries, IMF

programs and the Great Eight (G8) presidency. Against this backdrop, there has also been a wave of studies investigating the economic consequences of political instability in the global context (Aisen & Veiga, 2013).

Despite this growing body of literature, we still know very little about the predictability of the Arab Spring: an empirical challenge and source of debate in academic and policy making circles (Gause, 2011).

2.2 Theoretical highlights and motivation for the empirics

Consistent with Asongu (2014), the initial theories of growth that evolved with the fall of Keynesianism and re-emergence of the neoclassical revolution favored the concept of convergence. Nascent theories of economic growth that predicted absolute convergence were based on an extension of market equilibrium concepts (Mayer-Foulkes, 2010). Hence, it followed that cross-country economic catch-up resulted from policies of free market competition. In essence, the implementation of free market policies were supporting of convergence. The absence of catch-up (or absolute divergence) in initial income convergence studies (Barro, 1991) was later verified by Pritchett (1997) in the long-term. They maintain that under the exogenous neoclassical growth model, income convergences to a common steady state or to each country's long-run equilibrium irrespective of initial levels. By contrast, the endogenous growth theory predicts that income-level convergence is not feasible for two main reasons: the possibility of multiple equilibria and differences in initial endowments among countries.

The intuition motivating this examination is typically consistent with cross-country income catch-up and convergence literature that has been investigated and substantially documented in the context of neoclassical growth model, originally developed by the seminal works of Baumol (1986), Barro (1991), Mankiw *et al*. (1992) and Barro & Sala-i-Martin (1992, 1995). The theoretical underpinnings (Solow, 1956; Swan, 1956) of the income catch-

up literature have recently been applied to other areas of economic development. In essence, whereas there is a consensus on an underlying theory on income catch-up, other development branches do not yet have a theory for the reduction in cross-country dispersions in development parameters. Against this background, there has been a growing body of catch-up empirics in many development fields. Accordingly, there is currently a wealth of development literature applying convergence underpinnings to, inter alia: financial markets (Bruno et al., 2011; Narayan et al., 2011; Asongu, 2013b) and, intellectual property rights (IPRs) harmonization (Asongu, 2013a).

In light of the above, we are aware of the risk of 'doing measurement without theory'. Reporting facts even in the absence of a formal theoretical model is not a useless scientific activity[1]. In this spirit, we are consistent with Costantini & Lupi, (2005) and Narayan *et al.* (2011) in the postulation that applied econometrics should not be limited to the simple empirical exercise of either refuting or validating economic theories. Our risks are carefully calculated because of the heterogeneous nature of growth empirics (Islam, 1995). Even Blinder (1987) did not shock monetary scholars and policy makers when he completely banished interest rates in his credit rationing model[2].

The object of this paper invites one main question on the theoretical underpinnings of the empirics: why should we expect a complete elimination in the dispersion of factors that cause socio-political uprisings to predict the possibility of general chaos? The answer provides a theoretical timing for any unrest (potential social uprising, political instability or revolutions) without distinction of nationality or locality within a homogonous population for two main reasons. *First,* the evidence of catch-up in deplorable politico-economic conditions

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[1] For example, "*The reader should understand that this is merely an expositional device. We would not wish to deny that the interest elasticity and anticipatory error mechanisms have some validity. But the spirit of this paper is that those mechanisms do not seem important enough to explain the deep recessions that are apparently caused by central bank policy*" (Blinder, 1987, p. 2).

[2] "*In order to make credit rationing mechanism stand out in bold relief, most other channels of monetary policy (such as interest elasticities and anticipatory errors) are banished from the model*" (Blinder, 1987, p. 2).

means countries with better governance (political, economic and institutional) are catching-up with counterparts with worse governance. *Second,* full catch-up indicates that the cross-country politico-economic differences do not exist so that any spark of protest or revolution in one country can easily spread across borders.

Generally speaking, the inference from the aforementioned literature is that with full catch-up, factors that incite unrest are similar across countries. Hence, revolutions can spread without distinction of locality or nationality. In other words, the possibility of revolutions is completely harmonized across countries with a timeline contingent on the period of full catch-up. Convergence in negative signals of revolt could spread revolutionary movements across nations because the states become indifferent in signals of revolt. Accordingly, the presence of catch-up implies that countries with lower levels in the negative signals are catching-up their counterparts with higher levels in the negative signals. It is interesting to note that the objective of the study is not to discuss when and where revolutionary movements originate. The intuition for the empirics emphasizes that with full catch-up, a spark of protest in a country can spread to other states without distinction of nationality within a homogenous panel.

3. Data and Methodology
3.1 Data

We assess a sample of 14 MENA countries from the *World Bank Development Indicators* for the period 1996-2006. The choice of time period has a twofold justification. *First,* governance indicators are only available from 1996. *Second,* given the possible investigation horizon of fifteen years (1996-2010), a certain margin is needed from a projection date (say 2007) to the occurrence of the Arab Spring (2011 onwards). Hence, due to constraints in (1) the computations of non-overlapping intervals and (2) degrees of freedom needed for the estimation of conditional catch-ups, the projection base-year is set at 2007.

In line with the hypothetical underpinnings discussed in Section 2, we follow recent theoretical and empirical literature in measuring common determinants of the Arab Spring in terms of political governance, economic governance, institutional governance and general governance, unemployment and inflation in consumer prices (Jung, 2011; Storck, 2011; Khandelwal & Roitman, 2012; Thiel, 2012). Political governance (voice & accountability and political stability), economic governance (government effectiveness and regulation quality), institutional governance (rule of law and corruption control), general governance (political, economic & institutional) indicators are obtained with Principal Component Analysis (see Section 3.2.1). Classifications of governance indicators into political, economic and institutional components is consistent with Kaufmann *et al* (2010) and recent African governance literature (Andrés et al., 2014).

We control for recently documented determinants of the Arab Spring, notably: economic prosperity, government expenditure, external balances, population growth and trade openness (Khandelwal & Roitman, 2012). Accordingly, a deterioration of macroeconomic conditions could quickly lead to political unrest. Economic growth or macroeconomic uncertainty and deterioration of the economic fundamentals could either decrease or increase unemployment as a result of sizable output gains or losses. Very substantial external vulnerabilities can induce added pressures for insurrection and significant currency depreciation which could lead to high levels of inflation. There is also a general consensus among economists that high inflation could generate inefficiencies that eventually lead to social unrest due to reduction in economic growth and general social welfare (Aisen & Veiga, 2006). Greater flexibility in trade and government expenditure could influence access to employment and other economic opportunities. Moreover, the likelihood of political instability is significantly reduced when populations see governments delivering a higher standard of living.

Details of the descriptive statistics, correlation analysis, variable definitions and fundamental panels are presented in Appendix 1, Appendix 2, Appendix 3 and Appendix 4 respectively. From the summary statistics, there is some degree of variation in the data such that reasonable estimated nexuses could emerge. The correlation analysis serves to mitigate any potential concerns of multicollinearity and overparameterization. For robustness purposes we disaggregate the MENA into various fundamental panels: Middle East, North Africa, Short unrests, Long-unrests and Unrests[3].

3.2 Methodology

3.2.1 Principal Component Analysis

The high degree of substitution among governance indicators means some information could be irrelevant. Appendix 5 shows that the set of governance indicators are highly correlated. . Hence, we employ Principal Component Analysis (PCA) to mitigate the redundancy of common information in the political, economic, institutional and general governance indicators. PCA is a statistical method that is often used to reduce the large group of correlated indicators into a small set of uncorrelated indicators called principal components (PCs) which represent most of the variation in the original dataset. Accordingly, we reduce our six governance indicators to one common factor (general governance), then we further reduce the constituents of governance dynamics into three distinct variables. The *first* is political governance (*Polgov*) comprising voice and accountability and political stability. Polgov captures the constancy in the process by which those in authority are selected and replaced. The second is economic governance (*Ecogov*) involving regulation quality and government effectiveness. Ecogov denotes the capacity of government to formulate and implement policies as well as deliver services. The third is institutional governance (*Instgov*)

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[3] MENA: Middle East and North Africa. ME: Middle East. NA: North Africa. MENASU: MENA Short Unrests. MENALU: MENA Long Unrests. MENAU: MENA Unrests. Classification of degree of unrest (Short-unrest or Long-unrest) is based on exploratory evidence and qualitative content analysis on the severity of country-specific internal strife.

consisting of the rule of law and corruption control. Instgov represents the respect for citizens and the state of institutions that govern the interactions among them (Andrés et al., 2014).

The criterion used to retain common factors is consistent with Kaiser (1974) and Jolliffe (2002), who have recommended only PCs with a corresponding eigenvalue greater than one. For example, from Table 1 below, it can be noticed that: General governance (*G.Gov*) has an eigenvalue of 4.318 and represents more than 72 percent of variation in the six variables (government effectiveness, regulation quality, rule of law, corruption control, voice and accountability and political stability/no violence.

We do not perform country by country time series PCA before combining them into a panel PCA. Hence, we are aware that using data from all countries could generate artificial common patterns among the countries, which is an interest in panel data analysis.

Table 1: Principal Component Analysis (PCA) for Governance (Gov)

Principal Components	Component Matrix(Loadings)						Proportion	Cumulative Proportion	Eigen Value
	VA	PS	RQ	GE	RL	CC			
First PC (G.Gov)	0.248	0.369	0.431	0.456	0.456	0.447	0.719	0.719	4.318
Second PC	-0.832	0.527	-0.130	-0.009	0.091	0.069	0.156	0.876	0.941
Third PC	0.469	0.575	-0.627	-0.192	-0.060	0.128	0.059	0.936	0.358
First PC (Polgov)	0.707	0.707	---	---	---	---	0.544	0.544	1.089
Second PC	-0.707	0.707	---	---	---	---	0.455	1.000	0.910
First PC (Ecogov)	---	---	0.707	0.707	---	---	0.931	0.931	1.863
Second PC	---	---	-0.707	0.707	---	---	0.068	1.000	0.136
First PC (Instgov)	---	---	---	---	0.707	0.707	0.926	0.926	1.852
Second PC	---	---	---	---	-0.707	0.707	0.073	1.000	0.147

P.C: Principal Component. VA: Voice & Accountability. RL: Rule of Law. R.Q: Regulation Quality. GE: Government Effectiveness. PS: Political Stability. CC: Control of Corruption. G.Gov (General Governance): First PC of VA, PS, RQ, GE, RL & CC. Polgov (Political Governance): First PC of VA & PS. Ecogov (Economic Governance): First PC of RQ & GE. Instgov (Institutional Governance): First PC of RL & CC.

The interest of using four different measurements of governance is to increase the intricacy and robustness for more policy implications. Accordingly, since the governance variables are used independently across specifications and fundamental characteristics, the issue of contamination is less apparent at the empirical level. At the variable level, the combination of variables to indexes is to remain consistent with the definition of indicators. For instance, if political governance is defined as a combination of voice and accountability

and political stability, neither the former nor the latter can objectively be defined as political stability. A common denominator in both, through PCA is a better perception. Hence, the PCs generate regressors that are consistent with the definitions of composite indicators employed in the study. It should also be noted that, the PCs do not generate a regressor problem in the context examined in the paper because they are used independently as dependent variables. Some potential degree of correlation among dependent governance variables only adds subtlety to the analysis. It is important to distinguish the effects of economic, political and institutional components of general governance indicator because they reflect different policy variables.

3.2.2 Estimation technique

Many convergence approaches have been discussed in theoretical and empirical literature (Islam, 2003). In essence, differences exist in ways in which reduction in dispersions could be measured: income-convergence versus (vs) TFP (total factor productivity)-convergence; global-convergence vs. local or club-convergence; convergence within an economy vs. convergence across economies; deterministic-convergence vs. stochastic convergence; unconditional (absolute) vs. conditional convergence; convergence in terms of growth rate vs. convergence in terms of income and *beta*-convergence vs. *sigma*-convergence.

It is also worthwhile noting that there is some measure of nexus between the various catch-up definitions and the corresponding methodologies employed. Due to some circumstances, the correspondence could not be unique: for example formal and informal cross-sectional techniques, time series procedures (in part) and panel techniques have conditionally or unconditionally investigated *beta*-convergence. A plethora of the approaches have substantially focused on per capita income catch-up across economies. In addition, both panel and cross-sectional approaches have been employed to investigated TFP and club-

convergence. While the time series approach has been employed to assess catch-up across-economies as well as within an economy, the cross-sectional technique has been used to investigate *sigma*-convergence. Last but not the least, the distribution techniques have been employed in the assessment of the whole structure of within-distribution and distribution dynamics

The theoretical underpinnings of growth rate and income-level convergence have largely been based on the *beta*-convergence technique. It is founded on the supposition of higher capital marginal productivity in countries that are capital-scarce. It is assumed that poorer countries will grow faster only if they have similar saving rates which approach their richer counterparts. Under this scenario, a negative nexus between the initial income-level and the subsequent growth rate reflect some catch-up, known as *beta (*β)- convergence. However, as a shortcoming of this technique, a reduction in dispersion due to a negative *beta* may not necessarily reflect mitigation in dispersion. This shortcoming has led to the notion of *sigma*-convergence: the cross-sectional distribution's standard deviation of either growth rate or income-level. In spite of the drawback of *beta*-convergence being not a sufficient, but a necessary condition for *sigma*-convergence, researchers have continued to use this estimation strategy because it discloses information on structural growth models, while such parameters are not generally provided by the distribution approach.

The *beta*-convergence adopted in these empirics is broadly in line with the underpinnings of recent catch-up literature (Narayan et al., 2011). The estimation strategy is typically consistent with substantial evidence of income convergence across countries that have been assessed within the framework of pioneering studies in classical growth models (Baumol, 1986; Barro & Sala-i-Martin, 1992, 1995; Mankiw et al., 1992).

The two equations below denote the standard procedures for assessing conditional *beta*-convergence if $W_{i,t}$ is considered as strictly exogenous (Fung, 2009).

$$\ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = \beta \ln(Y_{i,t-\tau}) + \delta W_{i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \qquad (1)$$

$$\ln(Y_{i,t}) = a \ln(Y_{i,t-\tau}) + \delta W_{i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \qquad (2)$$

Where $a = 1 + \beta$, $Y_{i,t}$ is the measure of governance or the macroeconomic (inflation and unemployment) situation in country i at period t. $W_{i,t}$ is a vector of determinants of governance, unemployment and inflation, η_i is a country-specific effect, ξ_t is a time-specific constant and $\varepsilon_{i,t}$ an error term. In accordance with the neoclassical growth model, a negative and statistically significant *beta* coefficient in Eq. (1) means that countries relatively close to their steady state of governance will experience a slowdown in the growth or improvement of governance known as conditional convergence (Narayan et al., 2011, p. 2773). In the same vein, according to Fung (2009, p. 59), if $0 < |a| < 1$ in Eq. (2), then $Y_{i,t}$ is dynamically stable around the path with a trend growth rate similar to that of W_t and with a height relative to the level of W_t. Indicators contained in $W_{i,t-\tau}$ and the individual effect η_i are proxies for the long-term level *bad governance* is converging to. In essence, the country-specific effect η_i measures other factors determining a country's steady state that are not captured by $W_{i,t-\tau}$.

The conditions for catch-up as emphasized above are valid only if $W_{i,t}$ is strictly exogenous. In reality, unfortunately, this is not the case because components of $W_{i,t}$ (GDPg, trade, government expenditure, external balance, population growth) influence governance, unemployment and inflation, the reverse incidence is also possible as the deterioration of governance affects economic prosperity and other macroeconomic variables in the conditioning information set. For example, while there is a wide consensus among economists that inflation reduces society's welfare value as a result of poor governance, it is no less true that the quality of institutions favor political stability (Aisen & Veiga, 2006).

Hence, we are faced with another concern of endogeneity since components of $W_{i,t}$ are correlated with the error term ($\varepsilon_{i,t}$). Moreover, time- and country-specific impacts could be correlated with other indicators in the model as is often the case when lagged endogenous variables are introduced into the equations. A measure for tackling this issue of the correlation between the lagged dependent variable and individual specific-effects consists of suppressing the individual-effect by first differencing. Hence Eq. (2) becomes:

$$\ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = a(\ln(Y_{i,t-\tau}) - \ln(Y_{i,t-2\tau})) + \delta(W_{i,t-\tau} - W_{i,t-2\tau}) + (\xi_t - \xi_{t-\tau}) + (\varepsilon_{i,t} - \varepsilon_{i,t-\tau}) \qquad (3)$$

Unfortunately, estimation by Ordinary Least Squares (OLS) still produces biased estimators as there is still some correlation between the error term and the lagged dependent variable. Arellano & Bond (1991) have proposed usage of the Generalized Method of Moments (GMM) that exploits all the orthogonality conditions between the error term and the lagged endogenous variables. The procedure uses lagged levels of the variables as instruments in the differenced equation and lagged differences of the variables as instruments in the level equation, thus making-use of all the orthogonality conditions between the error term and the lagged dependent variables. We are consistent with Bond et al. (2001, pp. 3-4)[4] in preferring the *System* GMM estimation (Arellano & Bover, 1995; Blundell & Bond, 1998) to the *Difference* GMM estimation (Arellano & Bond, 1991).

The GMM estimation strategy which combines Equations (2) and (3) has been widely used in recent catch-up literature. In the specification of the estimation, we apply the *two-step* GMM to account for heteroscedasticity in the residuals. Accordingly, the *one-step* procedure is homoscedasticity-consistent. The hypothesis of the absence of autocorrelation in the

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[4] "*We also demonstrate that more plausible results can be achieved using a system GMM estimator suggested by Arellano & Bover (1995) and Blundell & Bond (1998). The system estimator exploits an assumption about the initial conditions to obtain moment conditions that remain informative even for persistent series and it has been shown to perform well in simulations. The necessary restrictions on the initial conditions are potentially consistent with standard growth frameworks and appear to be both valid and highly informative in our empirical application. Hence we recommend this system GMM estimator for consideration in subsequent empirical growth research*". (Bond et al. 2001, pp. 3-4).

residuals is important as past lagged regressors are to be employed as instruments for the dependent variables. The estimation depends on hypothesis that the lagged values of the endogenous variables and other independent regressors are valid instruments in the regression. We expect the first order autocorrelation (AR [1]) of the residuals to be significant while the (AR [2]) should not be. The latter is more valid because it measures the autocorrelation in difference. The Sargan overidentifying (OIR) test is used to assess the validity of the instruments.

Consistent with Islam (1995, p. 323), yearly time spans are not appropriate for studying catch-up because they are too short. In such brief time spans short-run disturbances may loom substantially large. Hence, considering the eleven year period (1996 through 2006), we use two-year non-overlapping intervals (NOI)[5]. In addition to the justifications provided above, we present three more reasons for the choice of two-year NOI. First and foremost, NOI with higher numerical values absorb business cycle disturbances while weakening the model. In essence, owing to the need to exploit the time series properties as much as possible, two-year NOI are preferred to three/four/five-year NOI. Second, conditional catch-up modeling requires more degrees of freedom. Therefore given the short-span of eleven years, higher order NOI will substantially limit the conditioning information set. This is essential in order to avoid misspecification in the conditional estimations. Hence, due to issues in degrees of freedom, the order of NOI bears an inverse relationship with the number of control variables employed. Third, from a heuristic perspective, visual analysis does not reveal any evidence of persistent short-term (business cycle) disturbances that justify higher NOI. The three explanations provided above have also been used to justify the choice of two-year NOI in recent catch-up literature (Asongu, 2013a).

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[5] Accordingly, we have six two-year non-overlapping intervals: 1996; 1997-1998; 1999-2000; 2001-2002; 2003-2004 ; & 2005-2006. The first value is short by one year due to issues in degrees of freedom.

In order to investigate the degree of diminishing dispersion in governance, unemployment and inflation measures, we compute the implied rate of catch-up by calculating $a/2$. Therefore, we divide the estimated value of the lagged endogenous variable by 2 because we have employed two-year NOI to absorb short-run disturbances. The criterion used to evaluate the existence of catch-up is the following: $0 < |a| < 1$. This means that the absolute value of the estimated lagged dependent variable is less than one but greater than zero. The implication is that past variations have a less proportionate effect on future variations, indicating that the difference on the left hand side of equation (3) is diminishing overtime or that the country is moving to a steady state.

It is important to note that in a standard dynamic GMM approach, the estimated lagged value is a from which 1 is subtracted to obtain β (β= a-1). Hence, within this framework, $\beta < 0$ is the information criterion for *beta*-convergence. For clarity and in order to reduce arithmetical exercises, a could be reported instead of β and the underlying information criterion $(0 < |a| < 1)$ used to assess catch-up. This latter interpretation is consistent with the bulk of recent literature (Prochniak & Witkowski, 2012a, p. 20; Prochniak & Witkowski, 2012b, p. 23).

4. Empirical Analysis
4.1 Presentation of results

This section examines three main concerns: (1) investigation of diminishing dispersions (or catch-up) in the dependent variables of interest (governance*, unemployment* and *inflation*); (2) determination of the level of reduction in dispersions (rate of catch-up) and; (3) computation of the time required for the complete elimination of dispersions (time required for full catch-up). The first issue guides the empirics on the feasibility of similar conditions in the dependent variables across countries, the second determines the degree of

similarity in such conditions, while the third reflects the time required for the similarity to be complete and dissimilarities indistinguishable across countries. In other words, the possibility of civil unrest in one country spreading to other countries due to similar conditions: the explosion of unrest without distinction of locality or nationality.

Table 2 below summarizes overall findings whereas Tables 3 and 4 respectively present results for absolute (unconditional) and conditional catch-up. The former is estimated with only the lagged difference of the dependent variable as an exogenous variable, whereas the latter incorporates the conditioning information set (control variables). In other words, unconditional catch-up is estimated in the absence of $W_{i,t}$: vector of determinants (economic prosperity, trade, government expenditure, external balances and population growth) of the dependent variables (governance, unemployment and inflation).

In order to examine the validity of the models and hence the catch-up hypotheses, we performs two tests: (1) the Arellano and Bond test for autocorrelation that investigates the null hypothesis of the absence of autocorrelation and (2) the Sargan test that examines the overidentification restrictions. In essence, this latter test examines if the instruments are not correlated with the error term in the main equation and its null hypothesis is the position that the instruments are strictly exogenous as a group (absence of endogeneity). The Wald statistics for the joint significance of estimated coefficients are also reported. Overwhelmingly for the most of the models: (1) the null hypotheses for the Sargan and AR(2) tests are not rejected and (2) the null hypothesis of the Wald statistics is rejected when estimated coefficients are significant.

Given the empirical dimension of this paper, we also devote some space to briefly discuss the computation of catch-up rates and time required for full catch-up or complete elimination of cross-country dispersions. For an estimated lagged initial value of 0.789 that is significant with valid instruments and no autocorrelation in the residuals: (1) the catch-up rate

is 39.45% ([0.789/2]*100) and (2) the length of time needed for full catch-up is 5.06 years (200%/39.45%). Hence, 5 years and about 21 days are needed to achieve 100% catch-up for an estimated initial value of 0.789 that is consistent with the information criterion: $0 < |a| < 1$.

Table 2 below presents a summary of the findings. This synthesis of the results is based on Tables 3 and 4. While the first half of Table 2 presents findings on *Difference* GMM modeling, the second-half shows results from *System* GMM estimations. The findings of the latter are more significant than those of the former. Panels A and B are based on absolute (unconditional) convergence. The results of absolute convergence are also relatively more significant than those of conditional convergence. Since potential biases in the *Difference* estimator are corrected by the *System* estimator, our policy recommendations are based on the latter estimation strategy.

In light of the above, the following findings could be established. First, under political governance the rate of absolute convergence (AC) varies between 20% and 39% per annum (p.a) with corresponding years to full convergence of 10 and 5.12years respectively. There is no evidence of conditional convergence (CC) in this governance dynamic. Second, with respect to economic governance, the rate of catch-up varies from 41.5% p.a to 49% p.a with corresponding period to full catch-up of between 4.81 and 4.08years. Third, under the scenario of institutional governance, full convergence is achieved between 4.39 and 5.55 years, resulting from catch-up rates of 45.5to 36% p.a. Fourth, the findings of general governance are broadly consistent with those of political, economic and institutional governance. Fifth, the CC results are not significant for inflation and unemployment while the rate of AC (time to full AC) is between 7 and 10% pa (28.5-20years) for the inflation and 39 to 39.5% p.a (5.12 to 5.06years) for unemployment. Sixth, with the exception of inflation, the average time to full convergence is between 4 and 5 years. We may therefore infer from a projection date of early 2007 that the Arab Spring could be predicted to occur between 2011

and 2012. The absence of convergence across some specifications and fundamental characteristics in Table 2 is evidence of convergence towards lower equilibria.

Most of the significant control variables in Table 4 have the expected signs. (1) *Economic prosperity, trade openness* and positive *external balances* potentially have positive effects on governance. (2) Positive demographic change could potentially infringe the ability of governments to effectively manage rising population. (3) Government expenditure that is channeled properly for macroeconomic prosperity could eventually mitigate inflation and unemployment.

Table 2: Summary of the findings

	MENA	ME	NA	SU	LU	U	MENA	ME	NA	SU	LU	U
			Difference GMM						**System GMM**			
						Panel A: Absolute Convergence (AC)						
						Panel A1: Political Governance						
AC?	No	No	Yes	No	No	No	No	Yes	Yes	No	No	No
Rate of AC	n.a	n.a	36%	n.a	n.a	n.a	n.a	20%	39%	n.a	n.a	n.a
Years to FAC	n.a	n.a	5.55Yrs	n.a	n.a	n.a	n.a	10Yrs	5.12Yrs	n.a	n.a	n.a
						Panel A2: Economic Governance						
AC?	No	No	Yes	No	No	No	Yes	Yes	Yes	Yes	No	Yes
Rate of AC	n.a	n.a	29	n.a	n.a	n.a	49%	47%	47.5%	41.5%	n.a	49%
Years to FAC	n.a	n.a	6.89Yrs	n.a	n.a	n.a	4.08Yrs	4.25Yrs	4.21Yrs	4.81Yrs	n.a	4.08Yrs
						Panel A3: Institutional Governance						
AC?	No	Yes	No	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes
Rate of AC	n.a	12.5%	n.a	28.0%	n.a	n.a	45.5%	n.a	40.0%	40.0%	37.5%	43.5%
Years to FAC	n.a	16Yrs	n.a	7.14Yrs	n.a	n.a	4.39Yrs	n.a	5Yrs	5Yrs	5.33Yrs	4.59Yrs
						Panel A4: General Governance						
AC?	No	Yes	Yes	No	No	No	Yes	Yes	Yes	No	Yes	Yes
Rate of AC	n.a	14.0%	44%	n.a	n.a	n.a	45.5%	49.5%	44.5%	37.0%	n.a	42.5%
Years to FAC	n.a	14.2Yrs	4.54Yrs	n.a	n.a	n.a	4.39Yrs	4.04Yrs	4.49Yrs	5.40Yrs	n.a	4.7Yrs
						Panel A5: Inflation						
AC?	No	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes
Rate of AC	n.a	n.a	5.50%	5.00%	7.5%	n.a	8.05%	n.a	10.0%	9.50%	n.a	7.0%
Years to FAC	n.a	n.a	36.3Yrs	40Yrs	26.6Yrs	n.a	24.8Yrs	n.a	20Yrs	21.0Yrs	n.a	28.5Yrs
						Panel A6: Unemployment						
AC?	No	No	No	No	No	No	Yes	No	No	Yes	No	Yes
Rate of AC	n.a	n.a	n.a	n.a	n.a	n.a	39.5%	n.a	n.a	39.0%	n.a	39.5%
Years to FAC	n.a	n.a	n.a	n.a	n.a	n.a	5.06Yrs	n.a	n.a	5.12Yrs	n.a	5.06Yrs
	MENA	ME	NA	SU	LU	U	MENA	ME	NA	SU	LU	U
						Panel B: Conditional Convergence (CC)						
			Difference GMM						**System GMM**			
						Panel B1: Political Governance						
CC?	No	No	No	No	No	No	No	No	No	No	No	No
Rate of CC	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Years to FCC	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
						Panel B2: Economic Governance						
CC?	No	No	No	No	No	No	Yes	No	No	No	No	Yes
Rate of CC	n.a	n.a	n.a	n.a	n.a	n.a	44.5%	n.a	n.a	n.a	n.a	46.5%
Years to FCC	n.a	n.a	n.a	n.a	n.a	n.a	4.49Yrs	n.a	n.a	n.a	n.a	4.30Yrs

					Panel B3: Institutional Governance							
CC?	No	No	No	Yes	No	No	Yes	Yes	No	No	No	Yes
Rate of CC	n.a	n.a	n.a	24.5%	n.a	n.a	38.0%	36%	n.a	n.a	n.a	37.0%
Years to FCC	n.a	n.a	n.a	8.16Yrs	n.a	n.a	5.26Yrs	5.55Yrs	n.a	n.a	n.a	5.40Yrs
					Panel B4: General Governance							
CC?	No	No	No	Yes	No	No	Yes	Yes	No	Yes	No	Yes
Rate of CC	n.a	n.a	n.a	48.5%	n.a	n.a	42.0%	32.5%	n.a	48.5%	n.a	42.0%
Years to FCC	n.a	n.a	n.a	4.12Yrs	n.a	n.a	4.76Yrs	6.15Yrs	n.a	4.12Yrs	n.a	4.76Yrs
					Panel B5: Inflation							
CC?	No	No	No	Yes	No	No	No	No	No	No	No	No
Rate of CC	n.a	n.a	n.a	11.5%	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Years to FCC	n.a	n.a	n.a	17.3Yrs	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
					Panel B6:Unemployment							
CC?	No	n.s.a	No	n.s.a	n.s.a	No	No	n.s.a	No	n.s.a	n.s.a	No
Rate of CC	n.a	n.s.a	n.a	n.s.a	n.s.a	n.a	n.a	n.s.a	n.a	n.s.a	n.s.a	n.a
Years to FCC	n.a	n.s.a	n.a	n.s.a	n.s.a	n.a	n.a	n.s.a	n.a	n.s.a	n.s.a	n.a

Yes: Significant evidence of Catch-up. No: insignificant evidence of Catch-up. AC: Absolute Catch-up. CC: Conditional Catch-up. Rate of AC: Rate of Absolute Catch-up. Rate of CC: Rate of Conditional Catch-up in years. FAC: Full Absolute Catch-up. FCC: Full Conditional Catch-up. MENA: Middle East & North Africa. ME: Middle East. NA: North Africa. SU: Short Unrest in MENA. LU: Long Unrest in MENA: U: Unrest in MENA. n.a: not applicable due to absence of significant catch-up. n.s.a: not specifically applicable because model could not be run due to issue in degrees of freedom.

Table 3: Absolute convergence

	Difference GMM						System GMM					
	Panel A: Political Governance											
	MENA	ME	NA	SU	LU	U	MENA	ME	NA	SU	LU	U
Initial	**0.49****	-0.063	**0.76****	**0.41***	1.00	**0.44****	0.350	**0.40****	**0.78****	**0.47****	**1.13****	0.410
	(0.033)	(0.784)	**(0.000)**	**(0.080)**	(0.102)	**(0.042)**	(0.212)	**(0.018)**	**(0.000)**	**(0.046)**	**(0.000)**	(0.144)
AR(2)	1.894*	**0.703**	1.620	1.905*	**0.368**	1.742*	1.739*	**1.266**	1.607	1.913*	**0.391**	1.65*
OIR	13.218	8.735	4.876	7.194	2.267	12.113	13.517	7.163	4.626	7.679	3.794	12.55
Wald	**4.53****	0.074	**10.6****	**3.05***	2.672	**4.11****	1.553	**5.562****	**18.3****	**3.96****	**10.6****	2.133
C'tries	14	9	5	8	5	13	14	9	5	8	5	13
Obs	56	36	20	32	20	52	70	45	25	40	25	65
	Panel B: Economic Governance											
	MENA	ME	NA	SU	LU	U	MENA	ME	NA	SU	LU	U
Initial	-0.033	0.241	**0.58****	0.307	0.407	0.021	**0.98****	**0.94****	**0.95****	**0.83****	**1.07****	**0.98****
	(0.943)	(0.288)	**(0.000)**	(0.146)	(0.110)	(0.968)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
AR(2)	**-1.276**	**-1.490**	0.417	**-1.214**	-0.480	**-1.279**	-1.254	-1.564	0.480	-1.384	-0.004	-1.352
OIR	9.926	8.450	3.921	7.455	4.238	10.33	13.266	7.565	3.785	7.230	4.809	12.915
Wald	0.005	1.127	**22.4****	2.109	2.541	0.001	**700****	**93.1****	**130****	**108****	**90.5****	**440****
C'tries	14	9	5	8	5	13	14	9	5	8	5	13
Obs	56	36	20	32	20	52	70	45	25	40	25	65
	Panel C: Institutional Governance											
	MENA	ME	NA	SU	LU	U	MENA	ME	NA	SU	LU	U
Initial	0.149	**0.250***	0.580	**0.56***	-0.001	0.315	**0.91****	**0.95****	**0.80****	**0.80****	**0.75****	**0.87****
	(0.555)	**(0.093)**	(0.143)	**(0.072)**	(0.997)	-0.234	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
AR(2)	**-0.711**	**-1.211**	0.471	**-0.179**	**-0.839**	**-0.234**	0.879	1.660*	0.348	-0.188	0.779	0.762
OIR	8.754	8.551	2.847	7.873	4.932	9.719	13.723	8.877	2.409	7.702	2.360	12.99
Wald	0.348	2.816*	2.136	3.234*	0.000	1.126	284***	268***	24.5***	37.8***	24.8***	361***
C'tries	14	9	5	8	5	13	14	9	5	8	5	13
Obs	56	36	20	32	20	52	70	45	25	40	25	65
	Panel D: General Governance											
	MENA	ME	NA	SU	LU	U	MENA	ME	NA	SU	LU	U
Initial	-0.020	**0.28***	**0.88****	0.465	0.134	0.031	**0.91****	**0.99****	**0.89****	**0.74****	**1.06****	**0.85****
	(0.815)	**(0.013)**	**(0.000)**	(0.176)	(0.743)	(0.818)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
AR(2)	**-0.123**	**-1.126**	0.350	0.201	**-0.550**	**-0.097**	-0.054	-0.545	0.346	-0.865	0.745	-0.107
OIR	6.607	8.415	3.66	7.833	4.861	9.027	12.965	7.037	4.666	6.486	3.814	12.012
Wald	0.054	**6.10****	**15.5****	1.826	0.106	0.052	**269****	**353****	**36.7****	**14.3****	**61.8****	**185****
C'tries	14	9	5	8	5	13	14	9	5	8	5	13
Obs	56	36	20	32	20	52	70	45	25	40	25	65

Panel E: Inflation

	MENA	ME	NA	SU	LU	U	MENA	ME	NA	SU	LU	U
Initial	-0.054	**-0.16***	**0.11***	**0.10***	**-0.15****	-0.059	**0.161****	**0.18***	**0.20***	**0.19***	0.154	**0.14****
	(0.668)	**(0.001)**	**(0.081)**	**(0.079)**	**(0.014)**	(0.656)	**(0.033)**	**(0.006)**	**(0.000)**	**(0.000)**	(0.143)	**(0.034)**
AR(2)	**-1.474**	-1.666*	**-1.111**	**-0.685**	**-1.231**	**-1.299**	**-1.536**	-1.663*	**-1.103**	**-0.486**	**-1.329**	**-1.370**
OIR	**8.778**	**6.998**	**4.184**	**4.010**	**4.575**	**7.873**	**10.229**	**6.684**	**3.181**	**4.911**	**4.683**	**9.799**
Wald	0.183	**10.49***	**3.031***	**3.078***	**6.00****	0.197	**4.547****	**7.30***	**14.7***	**38.3***	2.141	**4.47****
C'tries	12	7	5	6	5	11	12	7	5	6	5	11
Obs	45	25	20	21	20	41	57	32	25	27	25	52

Panel F: Unemployment

	MENA	ME	NA	SU	LU	U	MENA	ME	NA	SU	LU	U
Initial	**1.14***	0.159	**1.09***	**1.08***	-1.08	**1.14***	**0.79***	0.394	0.736	**0.78***	-0.84	**0.79***
	(0.000)	(0.909)	**(0.001)**	**(0.000)**	(0.459)	**(0.000)**	**(0.000)**	(0.695)	(0.165)	**(0.000)**	(0.538)	**(0.000)**
AR(2)	**0.554**	**0.543**	**0.610**	**0.702**	**0.696**	**0.554**	**0.844**	**0.560**	**0.846**	**0.882**	**0.658**	**0.844**
OIR	**3.959**	**0.000**	**3.883**	**2.006**	**0.035**	**3.959**	**3.968**	n.a	**3.952**	**2.005**	**0.016**	**3.968**
Wald	**16.8***	0.012	**9.60***	**23.0***	0.547	**16.8***	**1089***	0.153	1.927	**5934***	0.378	**1089***
C'tries	5	1	4	3	2	5	5	1	4	3	2	5
Obs	18	4	14	11	7	18	23	5	18	14	9	23

***, **, and * indicate significance at 1%, 5% and 10% levels respectively. Initial: Lagged dependent variable. AR(2): Second Order Autocorrelation test. OIR: Sargan Overidentifying Restrictions test. Z-statistics for AR(2) and Chi-square statistics for Sargan OIR and Wald (joint). Wald: Wald statistics for joint significance of estimated coefficients. C'tries: Countries. Obs: Observations. n.a: not application due in issues of degrees of freedom. MENA: Middle East & North Africa. ME: Middle East. NA: North Africa. SU: Short Unrest in MENA. LU: Long Unrest in MENA: U: Unrest in MENA. The significance of bold values is twofold. 1) The significance of estimated coefficients and the Wald statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(2) tests and; b) the validity of the instruments in the Sargan OIR test. P-values in brackets.

Table 4: Conditional convergence

	Difference GMM						System GMM					

Panel A: Political Governance

	MENA	ME	NA	SU	LU	U	MENA	ME	NA	SU	LU	U
Initial	0.238	-0.521	-2.337	0.260	-2.08	0.271	**0.49***	**0.57***	0.425	0.572	-0.08	**0.58***
	(0.549)	(0.217)	(0.267)	(0.885)	(0.239)	(0.341)	**(0.000)**	**(0.076)**	(0.725)	(0.209)	(0.911)	**(0.000)**
Constant	-0.147	0.001	0.417	-0.174	0.154	-0.151	**-0.522***	-0.049	0.157	-0.306	-0.857	-0.508
	(0.279)	(0.988)	(0.369)	(0.432)	(0.754)	(0.118)	**(0.060)**	(0.956)	(0.926)	(0.842)	(0.486)	(0.158)
GDPg	0.032	-0.005	-0.067	0.009	-0.028	0.009	**0.05***	0.043	0.048	0.004	0.001	**0.038***
	(0.376)	(0.818)	(0.461)	(0.924)	(0.702)	(0.635)	**(0.001)**	(0.250)	(0.383)	(0.948)	(0.976)	**(0.055)**
Trade	-0.000	-0.011	-0.019	0.007	-0.023	-0.002	0.003	0.002	-0.008	0.008	0.013	0.004
	(0.998)	(0.197)	(0.260)	(0.814)	(0.570)	(0.810)	(0.181)	(0.664)	(0.707)	(0.621)	(0.421)	(0.210)
Gov. Ex	-0.000	0.024	---	0.007	-0.142	-0.070	-0.0007	-0.015	---	-0.021	-0.066	0.003
	(0.995)	(0.552)		(0.938)	(0.421)	(0.463)	(0.959)	(0.681)		(0.498)	(0.381)	(0.747)
Ext. Bal	0.016	0.001	---	0.032	---	0.004	-0.003	0.001	---	-0.005	---	-0.002
	(0.440)	(0.872)		(0.581)		(0.840)	(0.666)	(0.822)		(0.567)		(0.750)
Popg	-0.022	-0.018	---	-0.027	---	-0.061	-0.029	-0.041	---	---	---	-0.071
	(0.707)	(0.628)		(0.751)		(0.317)	(0.305)	(0.135)				(0.355)
AR(2)	**1.047**	**-0.732**	**1.253**	**0.639**	n.a	1.852*	1.654*	**1.349**	**0.820**	1.881*	**-0.346**	1.925*
OIR	**10.724**	**2.228**	**0.034**	**5.012**	**0.000**	**7.266**	**4.115**	**2.972**	**0.885**	**4.560**	n.a	**5.738**
Wald	4.823	**11.03***	5.831	6.402	**31.2***	10.26	**71.08***	10.62	5.020	**13.5****	**66.2***	**154***
C'tries	14	9	5	8	5	13	14	9	5	8	5	13
Obs	51	32	19	30	19	49	65	41	24	38	24	62

Panel B: Economic Governance

	MENA	ME	NA	SU	LU	U	MENA	ME	NA	SU	LU	U
Initial	-0.152	-0.703	-0.171	0.215	-0.875	-0.490	**0.89***	**0.9***	-0.841	**0.629***	0.062	**0.93***
	(0.686)	(0.366)	(0.802)	(0.551)	(0.322)	(0.148)	**(0.000)**	**(0.001)**	(0.470)	**(0.095)**	(0.941)	**(0.000)**
Constant	-0.041	0.044	**-0.17****	-0.122	**-0.22****	-0.050	-0.300	-0.944	**-3.45***	-0.081	-1.279	-0.231
	(0.531)	(0.760)	**(0.048)**	(0.480)	**(0.043)**	(0.476)	(0.521)	(0.431)	**(0.056)**	(0.941)	(0.130)	(0.430)
GDPg	0.008	0.015	0.0004	-0.018	-0.004	0.009	-0.010	0.006	0.014	0.011	-0.117	-0.006
	(0.231)	(0.222)	(0.947)	(0.727)	(0.707)	(0.359)	(0.603)	(0.836)	(0.506)	(0.813)	(0.328)	(0.770)
Trade	0.009	0.002	**0.020****	0.004	0.003	0.008	0.003	0.003	**0.02***	0.005	0.032	0.002
	(0.212)	(0.833)	**(0.030)**	(0.661)	(0.780)	(0.108)	(0.508)	(0.627)	**(0.000)**	(0.584)	(0.172)	(0.435)
Gov. Ex	0.013	-0.024	---	-0.009	-0.112	-0.036	0.004	0.029	---	-0.021	-0.132	0.004
	(0.799)	(0.329)		(0.924)	(0.178)	(0.373)	(0.226)	(0.338)		(0.496)	(0.343)	(0.235)
Ext. Bal	0.002	-0.012	---	---	---	-0.006	0.002	0.002	---	---	---	0.001
	(0.820)	(0.210)				(0.428)	(0.327)	(0.578)				(0.592)
Popg	-0.033	-0.051	---	---	---	**-0.08***	-0.010	-0.015	---	---	---	---
	(0.229)	(0.102)				**(0.001)**	(0.442)	(0.533)				
AR(2)	**-0.128**	**-0.471**	**1.724**	1.877*	**-0.179**	**0.174**	**-1.457**	-1.74*	**1.434**	1.858*	**1.140**	**-1.529**
OIR	**8.544**	**2.098**	**1.140**	**4.314**	**0.000**	**6.287**	**6.304**	**4.236**	**0.115**	**5.029**	n.a	**5.948**
Wald	**11.66***	**16.9***	n.a	1.589	**12.39****	**42.5***	**34559***	**280***	n.s.a	**11.4****	**1826***	**1786***
C'tries	14	9	5	8	5	13	14	9	5	8	5	13
Obs	51	32	19	30	19	49	65	41	24	38	24	62

Panel C: Institutional Governance

	MENA	ME	NA	SU	LU	U	MENA	ME	NA	SU	LU	U
Initial	0.282	0.206	-1.289	**0.49****	**-4.35***	0.111	**0.76*****	**0.72*****	-0.461	1.528	-0.742	**0.74*****
	(0.587)	(0.760)	(0.665)	**(0.010)**	**(0.074)**	(0.802)	**(0.000)**	**(0.000)**	(0.682)	(0.135)	(0.368)	**(0.000)**
Constant	0.021	0.082	-0.039	0.128	**1.611***	-0.033	**-0.488****	-1.120	-3.338	2.061	**-3.61***	**-0.49****
	(0.897)	(0.606)	(0.764)	(0.253)	**(0.076)**	(0.743)	**(0.026)**	(0.452)	(0.237)	(0.598)	**(0.056)**	**(0.026)**
GDPg	-0.024	-0.042	0.006	-0.035	**0.13****	-0.001	-0.032	-0.052	0.013	-0.079	**-0.10***	**-0.040***
	(0.732)	(0.288)	(0.926)	(0.133)	**(0.029)**	(0.979)	(0.150)	(0.128)	(0.573)	(0.179)	**(0.080)**	**(0.097)**
Trade	0.007	0.006	0.007	-0.010	-0.007	0.012	**0.005****	0.009	0.030	-0.018	**0.05****	**0.007*****
	(0.680)	(0.728)	(0.702)	(0.532)	(0.658)	(0.223)	**(0.012)**	(0.100)	(0.278)	(0.624)	**(0.039)**	**(0.000)**
Gov. Ex	**0.097***	**0.118****	0.113	**0.08*****	**0.759***	**0.09****	0.010	0.030	---	-0.017	**-0.15****	0.008
	(0.079)	**(0.049)**	(0.236)	**(0.000)**	**(0.055)**	**(0.038)**	(0.186)	(0.510)		(0.707)	**(0.035)**	(0.341)
Ext. Bal	0.008	0.004	---	-0.001	---	0.010	0.001	0.006	---	-0.009	---	0.001
	(0.587)	(0.414)		(0.858)		(0.212)	(0.528)	(0.472)		(0.621)		(0.391)
Popg	-0.051	-0.044	---	---	---	**-0.07****	0.001	---	---	---	---	-0.045
	(0.232)	(0.390)				**(0.011)**	(0.983)					(0.218)
AR(2)	**0.133**	**0.484**	**0.555**	**0.401**	n.a	**-0.243**	**0.186**	**0.110**	**0.389**	**-0.692**	**-0.155**	**0.297**
OIR	**10.715**	**4.928**	**0.000**	**0.321**	**0.000**	**7.740**	**5.979**	**3.450**	**0.071**	**2.552**	**0.000**	**4.838**
Wald	**17.04*****	**13.91****	2.859	**22.7*****	5.232	**23.2*****	**604*****	**204*****	**28*****	**137*****	**283*****	**569*****
C'tries	14	9	5	8	5	13	14	9	5	8	5	13
Obs	51	32	19	30	19	49	65	41	24	38	24	62

Panel D: General Governance

	MENA	ME	NA	SU	LU	U	MENA	ME	NA	SU	LU	U
Initial	0.276	0.270	0.043	**0.97****	-0.637	0.062	**0.84*****	**0.65****	-0.219	**0.97****	0.341	**0.84*****
	(0.422)	(0.633)	(0.944)	**(0.022)**	(0.240)	(0.870)	**(0.000)**	**(0.048)**	(0.765)	**(0.033)**	(0.678)	**(0.000)**
Constant	-0.035	0.006	0.138	-0.078	0.266	-0.063	-0.646	-1.353	**-2.0*****	0.507	**-3.78***	-0.516
	(0.806)	(0.966)	(0.789)	(0.571)	(0.509)	(0.689)	(0.240)	(0.488)	**(0.001)**	(0.794)	**(0.074)**	(0.518)
GDPg	0.015	-0.017	0.046	-0.016	0.017	0.014	0.008	-0.020	0.009	-0.004	0.019	0.010
	(0.556)	(0.299)	(0.202)	(0.443)	(0.467)	(0.451)	(0.790)	(0.583)	(0.584)	(0.862)	(0.904)	(0.755)
Trade	0.007	-0.001	-0.000	-0.004	-0.033	0.006	0.005	0.011	0.009	-0.005	0.039	0.005
	(0.564)	(0.917)	(0.985)	(0.775)	(0.394)	(0.446)	(0.333)	(0.444)	(0.420)	(0.803)	(0.184)	(0.559)
Gov. Ex	0.069	0.061	0.043	0.059	-0.146	0.026	0.011	0.026	---	-0.001	-0.060	0.012
	(0.276)	(0.470)	(0.648)	(0.473)	(0.222)	(0.684)	(0.241)	(0.479)		(0.933)	(0.768)	(0.250)
Ext. Bal	0.014	0.005	---	**0.018****	---	0.010	0.001	0.011	---	---	---	0.002
	(0.138)	(0.768)		**(0.022)**		(0.393)	(0.513)	(0.182)				(0.426)
Popg	-0.055	-0.024	---	---	---	**-0.11****	-0.021	---	---	---	---	-0.086
	(0.350)	(0.650)				**(0.041)**	(0.773)					(0.422)
AR(2)	**-0.162**	**-1.149**	**1.205**	**-1.239**	**0.368**	**0.206**	**-0.380**	**-0.484**	**1.309**	**-1.343**	**-0.176**	**-0.212**
OIR	**7.402**	**2.690**	**0.000**	**1.554**	**0.000**	**7.459**	**8.553**	**4.699**	**0.041**	**3.332**	**0.000**	**7.183**
Wald	3.152	7.185	4.469	**19.6*****	**25.6*****	7.613	**679*****	**761*****	3.161	**17.5*****	**451*****	**560*****
C'tries	14	9	5	8	5	13	14	9	5	8	5	13
Obs	51	32	19	30	19	49	65	41	24	38	24	62

Panel E: Inflation

	MENA	ME	NA	SU	LU	U	MENA	ME	NA	SU	LU	U
Initial	0.003	-0.064	0.072	**0.23*****	-0.117	0.066	0.189	0.033	0.276	0.125	**1.766***	0.216
	(0.983)	(0.373)	(0.975)	**(0.000)**	(0.528)	(0.594)	(0.201)	(0.711)	(0.767)	(0.734)	**(0.085)**	(0.124)
Constant	0.258	**1.62*****	5.906	0.65**	9.493	-0.128	1.340	**17.22***	-11.45	0.324	217.9	0.725
	(0.737)	**(0.004)**	(0.870)	(0.026)	(0.244)	(0.776)	(0.636)	**(0.054)**	(0.807)	(0.910)	(0.129)	(0.742)
GDPg	0.251	-0.098	0.651	-0.059	3.154	0.090	0.345	0.017	0.906*	0.062	-7.46	0.264
	(0.464)	(0.401)	(0.709)	(0.311)	(0.184)	(0.514)	(0.206)	(0.963)	(0.068)	(0.627)	(0.177)	(0.131)
Trade	0.027	0.039	-0.406	-0.015	-0.005	-0.001	-0.0003	-0.036	0.104	0.010	-1.079	0.006
	(0.781)	(0.380)	(0.894)	(0.740)	(0.978)	(0.986)	(0.988)	(0.254)	(0.847)	(0.804)	(0.124)	(0.711)
Gov. Ex	0.301	0.337	-0.094	---	6.326	**-0.39****	**-0.079***	**-0.54****	0.154	---	-5.522	**-0.07****
	(0.480)	(0.388)	(0.983)		(0.372)	**(0.023)**	**(0.051)**	**(0.027)**	(0.752)		(0.117)	**(0.021)**
Ext. Bal	0.120	0.015	---	---	---	0.038	-0.001	---	---	---	---	-0.007
	(0.515)	(0.833)				(0.716)	(0.943)					(0.606)
Popg	---	---	---	---	---	---	---	---	---	---	---	---
AR(2)	**-1.538**	**-0.962**	**0.166**	**-0.537**	**0.882**	-1.850*	-1.815*	**-0.910**	**-1.353**	**-0.762**	**0.160**	-1.868*
OIR	**8.986**	**0.699**	**0.000**	**2.698**	**0.000**	**2.670**	**7.494**	**2.614**	**0.000**	**3.871**	n.s.a	**3.265**
Wald	3.966	**30.3*****	**30.8*****	**77.2*****	**24.2*****	**23.2*****	**23.2*****	**39.9*****	**75*****	1.100	**34*****	**27.3*****
C'tries	12	7	5	6	5	11	12	7	5	6	5	11
Obs	42	23	19	21	19	40	54	30	24	27	24	51

Panel F: Unemployment

	MENA	ME	NA	SU	LU	U	MENA	ME	NA	SU	LU	U
Initial	**1.792****	---	-0.147	---	---	-0.029	2.592	---	**2.870***	---	---	0.190
	(0.040)		(0.868)			(0.770)	(0.146)		**(0.099)**			(0.225)
Constant	**-6.186***	---	-1.763	---	---	0.027	-46.29	---	-53.41	---	---	0.956
	(0.081)		(0.373)			(0.945)	(0.534)		(0.174)			(0.729)

GDPg	**1.415*** (**0.098**)	---	0.544 (0.491)	---	---	0.178 (0.616)	0.806 (0.445)	---	1.244 (0.318)	---	---	0.318 (0.403)
Trade	**0.977*** (**0.097**)	---	-0.137 (0.334)	---	---	0.022 (0.750)	0.186 (0.742)	---	0.234 (0.109)	---	---	0.010 (0.729)
Gov. Ex	1.773 (0.195)	---	---	---	---	**-0.290*** (**0.057**)	0.952 (0.285)	---	---	---	---	**-0.10**** (**0.041**)
Ext. Bal	---	---	---	---	---	---	---	---	---	---	---	---
Popg	---	---	---	---	---	---	---	---	---	---	---	---
AR(2)	n.a	n.s.a	**0.698**	n.s.a	n.s.a	**-1.542**	**-1.273**	n.s.a	**-1.064**	n.s.a	n.s.a	-1.81*
OIR	n.a	n.s.a	n.a	n.s.a	n.s.a	7.784	n.a	n.s.a	**0.000**	n.s.a	n.s.a	8.751
Wald	**10.99****	n.s.a	5.539	n.s.a	n.s.a	**13.8***	**652***	n.s.a	3.037	n.s.a	n.s.a	**10.94***
C'ries	5	n.s.a	4	n.s.a	n.s.a	11	5	n.s.a	4	n.s.a	n.s.a	11
Obs	18	n.s.a	14	n.s.a	n.s.a	40	23	n.s.a	18	n.s.a	n.s.a	51

***, **, and * indicate significance at 1%, 5% and 10% levels respectively. Initial: Lagged dependent variable. AR(2): Second Order Autocorrelation test. OIR: Sargan Overidentifying Restrictions test. Z-statistics for AR(2) and Chi-square statistics for Sargan OIR and Wald (joint). GDPg: GDP growth. Gov. Ex: Government Expenditure. Ext. Bal: External Balance. Popg: Population growth. Wald: Wald statistics for joint significance of estimated coefficients. C'ries: Countries. Obs: Observations. n.a: not applicable due in issues of degrees of freedom. n.s.a: not specifically applicable because model could not be run due to issue in degrees of freedom. MENA: Middle East & North Africa. ME: Middle East. NA: North Africa. SU: Short Unrest in MENA. LU: Long Unrest in MENA: U: Unrest in MENA. The significance of bold values is twofold. 1) The significance of estimated coefficients and the Wald statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(2) tests and; b) the validity of the instruments in the Sargan OIR test. P-values in brackets.

4. 2 Discussion of results, caveats and future direction

4.2.1 Discussion of results

Consistent with the recent bulk of empirics in the catch-up literature, it is important to understand the underpinnings of absolute and conditional convergences before discussing the results. Absolute convergence (AC) is principally the end of common factors: *inter alia,* the adoption of single currency and monetary unions. The framework of the study extends well beyond monetary policies to common governance conditions among countries. Hence, AC means that states share the same fundamental characteristics with respect to governance conditions such that the only difference between the countries is in initial levels of governance. Therefore the absence of AC in some panels could be due to differences in starting-levels of governance. On the other hand, the presence of AC implies that beyond the possibility of dissimilar initial conditions among countries, there are certain common regional factors (from without) that have led to countries with poor governance catching-up to their counterparts with poorer governance conditions.

Conversely, conditional convergence (CC) shows the type of catch-up whereby the country's long-term equilibrium or steady state is conditional on the structural and

institutional characteristics that are fundamental to the economy or market. Thus, when countries within the same fundamental characteristic are different in the factors determining governance conditions, it is likely for conditional convergence to occur. In essence, if countries differ in structural and institutional characteristics relating the quality of government, then CC can take place. Hence, this type of catch-up is contingent on the variables selected and empirically tested. With constraints in degrees of freedom needed for the overidentifying restrictions (OIR) test in this type of catch-up, we have based the analysis on five macroeconomic variables (*economic prosperity, trade openness, government expenditure, external balances, population growth*). This conditioning information set is quite robust because some CC estimations in the recent literature have not been contingent on more than two variables (Bruno et al., 2012). In essence, CC could take place if there are cross-country MENA differences in the conditioning information set that determine governance, inflation and unemployment. Hence, the overwhelming evidence of CC implies differences in factors related to the dependent variables (quality of government, stability of food prices and unemployment) are blurring. In other words, while catch-up implies the possibility that a common revolution is feasible; full catch-up produces the timeline for such a possibility.

We have observed from the findings above that with the exception of inflation, the average time for full catch-up is between 4 and 5 years. Given a periodicity of 1996 to 2006, with a projection date of early 2007, it is feasible for the Arab Spring to have occurred between 2011 and 2012. But what is the insight underpinning this feasibility? Addressing this question is crucial to understanding the empirical results. A full catch-up period of 4 to 5 years in factors (poor governance, unemployment and inflation) likely to incite social unrest in the MENA region from a projection date of 2007 further implies that, between 2011 and 2012: (1) countries with the poor governance have completely caught-up with states with poorer government quality (political, economic and institutional); (2) nations with high

unemployment rates have reached the higher unemployment rates observed in neighbouring countries and (3) countries with low inflation rates are now experiencing soaring food prices by the same degree as those with high initial inflation figures.

With the above three scenarios united, any spark of protest in one country can spread to others, meaning that between 2011 and 2012, conditions for a revolution were without distinction of nationality or locality in the MENA region. In other words, poor governance, inflation and unemployment levels were comparable across the group of MENA countries during the time of the mass uprising. In essence, full catch-up in the period (2011 to 2012) further indicates that the cross-country politico-economic differences are inexistent in the MENA such that a revolution in one country could easily spread to other countries with the same governance, unemployment and inflation. In other words, factors that incite social unrest are similar across countries, paving the way for revolutions to spread without distinction of locality or nationality. In summary, the possibility of revolutions is completely harmonized across countries. This interpretation is broadly consistent with the majority of recent catch-up literature.

4.2.2 Caveats, cautions and future direction

Two main caveats of, and two principal cautions in the empirics are worth discussing. While the former entails issues in the theoretical and empirical underpinnings, the latter concerns signals in the dependent variables and structure of independent variables.

First, the use of econometrics to achieve more than just testing the validity of existing theories is not without drawbacks. However, the hypotheses underlying the study are strongly supported by the vast amount of recent studies in catch-up literature which used the same empirical underpinnings.

Second, while we have already justified the choice of the catch-up approach in the empirical section, it is also interesting to point-out the shortcomings of such a strategy. We

have stopped short of computing corresponding *sigma*-convergence coefficients because the analysis is an adaption to a methodological innovation in the estimation *beta*-convergence. As emphasized by Apergis et al. (2010), critics of this catch-up approach dispute that if countries converge to a common equilibrium, then the dispersion of the dependent variables should in the long-term converge on the same path. On the other hand, Miller & Upadhyay (2002) have claimed that if countries converge to their own unique equilibriums or convergence clubs, then the dispersion of this indicator will not approach zero. In addition, the dispersion movement is conditional on the initial distribution of the variables.

Some emphasis on caution is also worthwhile. (1) Signaling is important in correctly calibrating the dependent variables because social unrest and revolutions are most likely only in the presence of negative signals or information. While consumer price inflation and unemployment rate are negative signal variables, governance indicators are generally intended to reflect positive signals. Hence, catch-up in governance indicators may be construed as positive and a mitigating factor to any potential revolution. This does not represent an issue in our analysis for two main reasons: range in measurement of government variables and skewness of governance in the MENA region. First, governance variables have positive and negative values which broadly represent good and bad governance. Second, most governance variables are overwhelmingly skewed to the left (negative), implying that the MENA countries have bad governance on average. (2) On the structure of the conditioning information set, caution is recommended in the interpretation of the results because conditional catch-up modeling is contingent on the variables we choose and empirically test. Hence, indicators may not directly reflect all macroeconomic differences needed for conditional catch-up to take place. As we have outlined before, there is nothing we can do about this because the conditioning information set bears an inverse relation with degrees of freedom needed for conditional modeling.

Since the term "Arab Spring" is attributed to the diffusion of the revolutionary movements in the Arab Countries, one is tempted to think that better instruments could be provided by spatial econometrics tools which could appropriately take into account diffusion and spillover effects. This is an interesting future research direction.

Conclusion

This study has assessed the predictability of the 2011 Arab Spring mass insurrection. We have examined whether these revolutions could have been foreseen due to a complete elimination in the dispersion of core demands for better political, economic and institutional governance, more jobs and stable consumer prices. A recent methodological innovation in catch-up has been employed to investigate the feasibility and timing of a potential revolution. The intuition for such a general unrest is twofold: (1) evidence of catch-up in deplorable politico-economic conditions implies that MENA countries with depraved governance are catching-up with their counterparts under worse government and (2) full catch-up means that politico-economic differences are non-existent such that any spark of protest in one country can easily spread across borders. In this context, the possibility of a revolution is completely harmonized across countries.

The empirical evidence which has been based on fourteen MENA countries for the period 1996 to 2006 reveals that from a projection date of 2007, the Arab Spring was predictable within 4 to 5 years or between 2011 and 2012. This paper attempted to answer a key concern on whether political and economic trends were common in North African countries prior to the Arab Spring. Such should contribute to the empirics of predicting revolutions and the scarce literature on modeling the future of socio-economic events. It is also original in its approach to understanding past trends in political and economic policies leading to the rolling back of countries. Caveats, cautions and a future research direction have been discussed.

Like Blinder (1987), we ask the reader to understand that this is an expositional analysis. We do not wish to advocate that revolutions can be predicted in a strict sense based on these empirics. But the spirit of the paper is that when cross-country dispersions in signals of revolutions and social unrest are in course of being completely eradicated, reforms are needed to prevent the potential consequences of cross-country politico-economic and social revolutions.

Appendices

Appendix 1: Summary statistics

	Mean	SD	Minimum	Maximum	Observations
Political Stability	-0.180	0.778	-2.030	1.113	84
Voice & Accountability	-0.828	0.416	-1.920	-0.183	84
Political Governance	0.146	1.081	-2.426	1.777	84
Government Effectiveness	-0.038	0.531	-1.100	0.837	84
Regulation Quality	-0.113	0.631	-1.947	1.111	84
Economic Governance	-0.044	1.361	-3.360	2.500	84
Rule of Law	0.027	0.630	-1.450	0.887	84
Control of Corruption	-0.042	0.603	-0.973	1.225	84
Institutional Governance	0.007	1.338	-2.719	2.256	84
General Governance	0.031	2.064	-4.062	3.546	84
Inflation	3.394	5.047	-9.305	30.734	69
Unemployment	10.590	7.185	0.700	29.800	46
GDP Growth	4.704	2.826	-2.800	13.760	79
Trade Openness	83.701	29.571	38.690	173.83	81
Government Expenditure	15.169	8.889	2.250	33.012	81
External Balance on Commodities	4.663	17.964	-42.404	41.985	81
Population growth	2.644	2.329	0.012	15.668	84

S.D: Standard Deviation.

Appendix 2: Correlation analysis

Polgov	Ecogov	Instgov	G.Gov	Infl.	Unempl	GDPg	Trade	Gov.Ex	Ext.Bal	Popg	
1.000	0.765	0.831	0.887	-0.155	-0.623	0.197	0.359	0.232	-0.002	0.220	Polgov
	1.000	0.863	0.948	-0.186	-0.540	0.208	0.622	0.146	0.087	0.263	Ecogov
		1.000	0.967	-0.299	-0.705	0.2112	0.510	0.306	0.234	0.277	Instgov
			1.000	-0.253	-0.673	0.223	0.555	0.250	0.155	0.276	G.Gov
				1.000	0.230	0.155	-0.124	-0.188	-0.231	0.209	Infl.
					1.000	-0.107	-0.255	-0.626	-0.338	-0.429	Unempl
						1.000	0.248	-0.152	0.242	0.435	GDPg
							1.000	0.306	0.161	0.319	Trade
								1.000	0.147	0.143	Gov.Ex
									1.000	0.291	Ext.Bal
										1.000	Popg

Polgov: Political governance. Ecogov: Economic governance. Instgov: Institutional governance. G.Gov: General governance. Infl: Inflation. Unempl: Unemployment. GDPg: GDP growth. Gov. Ex: Government Expenditure. Ext.Bal: External Balance on commodities. Popg: Population growth.

Appendix 3: Variable Definitions

Variables	Signs	Variable Definitions (Measurement)	Sources
Political Stability	PolSta	"Political stability/no violence (estimate): measured as the perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional and violent means, including domestic violence and terrorism".	World Bank (WDI)
Voice & Accountability	V&A	"Voice and accountability (estimate): measures the extent to which a country's citizens are able to participate in selecting their government and to enjoy freedom of expression, freedom of association and a free media".	World Bank (WDI)
Political Governance	Polgov	"First Principal Component of Political Stability and Voice & Accountability. The process by which those in authority are selected and replaced".	PCA
Government Effectiveness	Gov. E	"Government effectiveness (estimate): measures the quality of public services, the quality and degree of independence from political pressures of the civil service, the quality of policy formulation and implementation, and the credibility of governments' commitments to such policies".	World Bank (WDI)
Regulation Quality	RQ	"Regulation quality (estimate): measured as the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development".	World Bank (WDI)
Economic Governance	Ecogov	"First Principal Component of Government Effectiveness and Regulation Quality. The capacity of government to formulate & implement policies, and to deliver services".	PCA
Rule of Law	RL	"Rule of law (estimate): captures perceptions of the extent to which agents have confidence in and abide by the rules of society and in particular the quality of contract enforcement, property rights, the police, the courts, as well as the likelihood of crime and violence".	World Bank (WDI)
Corruption Control	CC	"Control of corruption (estimate): captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests".	World Bank (WDI)
Institutional Governance	Instgov	"First Principal Component of Rule of Law and Corruption Control. The respect for citizens and the state of institutions that govern the interactions among them"	PCA
General Governance	G.gov	"First Principal Component of Political, Economic and Institutional Governances"	PCA
Inflation	Infl	Consumer Price Index (annual %)	World Bank (WDI)
Unemployment	Unempl	Total Unemployment (% of Total Labour Force)	World Bank (WDI)
GDP growth	GDPg	Gross Domestic Product (GDP) growth (annual %)	World Bank (WDI)
Trade Openness	Trade	Export plus Imports of Commodities (% of GDP)	World Bank (WDI)
Government Expenditure	Gov.Ex	Government Final Consumption Expenditure (% of GDP)	World Bank (WDI)
External Balance	Ext.Bal	External Balance on Commodities (% of GDP)	World Bank (WDI)
Population growth	Popg	Population growth rate (annual %)	World Bank (WDI)

WDI: World Bank Development Indicators. PCA: Principal Component Analysis.

Appendix 4: Fundamental panels

MENA	ME	NA	MENASU	MENALU	MENAU
Algeria		Algeria	Algeria		Algeria
Bahrain	Bahrain			Bahrain	Bahrain
Egypt		Egypt		Egypt	Egypt
Jordan	Jordan		Jordan		Jordan
Kuwait	Kuwait		Kuwait		Kuwait
Lebanon	Lebanon		Lebanon		Lebanon
Libya		Libya		Libya	Libya
Morocco		Morocco	Morocco		Morocco
Oman	Oman		Oman		Oman
Qatar	Qatar				
Saudi Arabia	Saudi Arabia		Saudi Arabia		Saudi Arabia
Tunisia		Tunisia		Tunisia	Tunisia
UAE	UAE		UAE		UAE
Yemen	Yemen			Yemen	Yemen
14	9	5	8	5	13

MENA: Middle East and North Africa. ME: Middle East. NA: North Africa. MENASU: MENA Short Unrests. MENALU: MENA Long Unrests. MENAU: MENA Unrests.

Appendix 5: Correlation analysis for Governance variables

VA	PS	RQ	GE	RL	CC	
1.000	0.659	0.701	0.680	0.723	0.665	VA
	1.000	0.630	0.640	0.795	0.684	PS
		1.000	0.812	0.814	0.729	RQ
			1.000	0.883	0.836	GE
				1.000	0.871	RL
					1.000	CC

VA: Voice & Accountability. RL: Rule of Law. R.Q: Regulation Quality. GE: Government Effectiveness. PS: Political Stability. CC:Control of Corruption..

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