THESIS/DISSERTATION APPROVED BY

April 30, 2012

Terry D. Clark, Ph.D.

Erika Moreno, Ph.D.

Graham Ramsden, Ph.D.

Gail M. Jensen, Ph.D., Dean
EXPLAINING REGIME CHANGE: A DIRECTED ACYCLIC GRAPH

By
KARLY HERMANSON

A THESIS

Submitted to the faculty of the Graduate School of the Creighton University in Partial Fulfillment of the Requirements for the degree of Master of Arts in the Department of International Relations

Omaha, NE
(April 30, 2012)
ABSTRACT

The ongoing Arab Spring, like the demise of colonial rule in Africa and the civil wars in Latin America before it, has shifted attention yet again to the question of why some regimes fail and others do not. This paper seeks to discover the conditions under which regime change occurs. Following Pearl (2000), I build a Bayesian network (using a directed acyclic graph) based on theory from which I then derive testable hypotheses. I use discrete-time analysis to test two models using data for the dependent variable from the Democracy & Dictatorship Revisited Dataset (Cheibub, Gandhi, & Vreeland 2009). The models suggest that deflationary crises and an increased magnitude of internal violence increase the probability of regime change. In addition, they indicate that decreased state fiscal capacity and lower professionalism and autonomy of the bureaucracy also increase this probability. The theoretical and empirical results of this study provide significant insights for explaining regime change and will continue to have substantive implications for the post-Arab Spring research agenda.
# TABLE OF CONTENTS

A Renewed Interest in Regime Change  
Relevant Approaches to Regime Change  
A Directed Acyclic Graph (DAG) of Regime Change  
Specifying the Models  
Data & Method  
Results  
Conclusions & Implications: A Way Ahead  
Appendices  
Bibliography
LIST OF FIGURES

Figure 1: Societal Mobilization Path to Regime Change 5
Figure 2: Elite & Institutional Breakdown Path to Regime Change 8
Figure 3: Two Main Paths to Regime Change 8
Figure 4: A Directed Acyclic Graph of Regime Change 10
Figure 5: Regime Survival Function 19
**LIST OF TABLES**

Table 1: Central Tendencies of the Dependent Variable ....................................................... 18

Table 2: Central Tendencies of Magnitude of Violence, Inflation, and Urbanization Rate .......... 20

Table 3: Central Tendencies of Log Income Per Capita and Regulation of Participation .......... 21

Table 4: Results of Logistic Regression, Fixed Effects Logistic Regression, and Random Effects Logistic Regression Regressing Regime Change on Magnitude of Violence, Inflation, and Urbanization Rate ........................................................................................................ 23

Table 5: Odds Ratios of Logistic Regression, Fixed Effects Logistic Regression, and Random Effects Logistic Regression Regressing Regime Change on Magnitude of Violence, Inflation, and Urbanization Rate ........................................................................................................ 24

Table 6: Results of Logistic Regression, Fixed Effects Logistic Regression, and Random Effects Logistic Regression Regressing Regime Change on Logged Income Per Capita Controlling for Regulation of Participation ................................................................................................................ 26

Table 7: Odds Ratios of Logistic Regression, Fixed Effects Logistic Regression, and Random Effects Logistic Regression Regressing Regime Change on Logged Income Per Capita Controlling for Regulation of Participation ................................................................................................................ 27
A Renewed Interest in Regime Change

Scholars have long considered the question of why some regimes fail and others do not. The cascade of colonial rule’s demise across Africa and the civil wars that plagued Central and South America during the 1970s and 1980s gave scholars of comparative politics a wealth of information from which to derive empirical analyses. The Arab Spring of 2011 has quickly brought the question of regime change back into focus. Tunisia’s Ben Ali, Egypt’s Hosni Mubarak, and Libya’s Muammar Gaddafi all fell to masses demanding civilian government within the first months of 2011 while protests continued in Syria and Yemen. Moreover, the processes by which those that fell did so were distinct and involved different societal expressions of dissatisfaction with the regime and varying levels of organized, armed opposition.

While published data sources may not currently reflect these new cases of regime change, scholars can prepare models using available data in anticipation of the future data that will reflect the current wave of instability. Understanding the theory of regime change will be of utmost importance to explaining and predicting the phenomenon and will allow scholars to simply update models with the new data once published. Up to this point, scholars have thoroughly contested the causes of political uprisings, mobilization, civil wars, and democratic transitions, resulting in a myriad of empirical studies.

However, the most common contribution to the literature is to simply add a new variable to a regression model of an existing analysis without delving into why that particular combination of variables provides the greatest explanatory power. In this paper, I seek to address this by providing not a new model for studying the phenomenon of regime
change, but instead an alternative to the common way of specifying models in answering the question of why some regimes fail while others do not.

The definition of regime stability has sparked a spirited debate in the literature. Some authors define political stability according to the length of time that a particular leader is in power (Russet 1964). This definition, however, does not hold across all regimes; in a democracy, leaders change on regular intervals as an indication of the stability of the electoral system rather than of instability. Other authors have accounted for this by defining instability as the probability of irregular governmental change or extra-constitutional change (Feng 2003). Goldstone, et. al. (2010) define “adverse regime changes” as “major, adverse shift in political institutions that involve the sudden loss of authority of central state institutions and/or their replacement by a more radical or nondemocratic regime.” Yet another definition in the literature says that instability is determined by the presence of one or more of the following: civil protest; politically motivated violence; or instability within the regime (Hann 2007). I choose to define stability in the simplest way possible: stability is measured as the length of time that the regime has been in place. This definition does not account for the various means through which groups destabilize a regime (I view these as independent variables) nor define any specific criteria for instability. Instead it accounts for the end product of an unstable regime, which is its removal. Thus, an increase in the time a regime has been in power is indicative of a continually stable regime.

In this paper, I develop a directed acyclic graph (DAG) to visually represent the hypothesized interrelationships and test two discrete-time models of regime change. I find that several variables interact to produce regime change. Lack of well-being,
changing demographics, ethnic diversity, and increased social networks lead to a heightened chance of popular mobilization, which can then lead to regime change. Natural resources can lead to a state with an unprofessional and non-autonomous bureaucracy and increased fiscal capacity. These increase the probability of elite fissures, which then increase the probability of a challenge to the state’s monopoly on the use of force; this can also lead to regime change. Additionally, economic crisis can trigger regime change when the aforementioned conditions exist.

**Relevant Approaches to Regime Change**

Theory on regime change began to surface as early as the late 1960s but has progressed considerably since it was first discussed in the literature. Early discussions in the literature centered around modernization and relative deprivation theory, which examined the effects of societal change and individual expectations, respectively, on popular mobilization. The discussion then turned to elites and institutions. Elite theory has offered the survival of regimes depends on the unity of the elite. Institutional theorists bridged the discussion between individual popular mobilization, the role of elites, and actual regime change by demonstrating the ways in which the formation of both formal and informal institutions affects political instability. While all of these approaches have contributed a great deal to the explanation of regime change or instability, none in isolation can capture the macro-level picture of its processes. In what follows, I review the hypotheses in the literature in an attempt to provide a picture of regime change theory in its entirety. I begin by depicting the process of mobilization
through modernization and relative deprivation theory and move on to describe more recent literature addressing the role of elites and institutions.

Samuel P. Huntington was one of the first scholars of modernization theory. His book, *Political Order in Changing Societies* (1968), explains a process of societal modernization in which institutional change cannot keep up with societal change; thus, society overthrows current institutions to make way for a form of government that can meet modern demands. The theory follows the movement of everything in society from simple to sophisticated, agrarian to industrial, and rural to urban. Society’s education and participation in a market economy increases while state institutions remain traditional or closed. The modernization of society before the state’s institutions accordingly change sparks popular mobilization. Some modernization scholars would offer a structural viewpoint in which the dominant hypothesis is that the level of economic development causes the variation in regime stability. Increasing levels of social mobilization (through means such as literature, media exposure, and education) combined with low levels of economic growth and limited mobility opportunities result in a higher level of non-institutionalized action (Huntington 1968).

Ted Gurr (1968, 1970) posited that even if the state were to keep up with the rate of modernization of society, citizens would still likely discern a discrepancy between what they perceive they ought to have and what they actually had. Gurr termed this feeling “relative deprivation,” inciting a trend of discussion in the literature. People must have something or someone on which to base this comparison and perceive the discrepancy; if not, relative deprivation does not exist. When anger spreads among the masses because of feelings about the state’s role in their relative deprivation, rebellion
occurs. This theory has often been criticized for the lack of the ability to measure a perception of the discrepancy. Francis Stewart (2000) remains loyal to the relative deprivation approach but attempts to address this qualm with his contention that a perceivable discrepancy exists within inequalities among culturally constructed groups, termed “horizontal inequalities,” which lead to political disturbances.

Both relative deprivation theory and modernization theory offer explanations of the role of individuals in social revolution. More succinctly, they explain popular mobilization. Visually depicted, these theories give us Figure 1 below: mobilization causes regime change.

![Figure 1](image)

Societal Mobilization Path to Regime Change

Scholars, however, were disappointed with the predictive power of these theories with regard to regime change. Relative deprivation and modernization do not take into account the structures within which the individuals act as well as which individuals control those structures. Later scholars recognized this discrepancy and began to take into account the role of elites and institutions.

Elite theory posits that there exists a small group of people comprising military, corporate, and political realms of society with interwoven interests; it is this limited group of elites that holds all power in society while the ordinary citizen is a relatively
powerless actor (Mills 1956). Scholars have long argued that elite unity is an important determinant in regime type (e.g., Pareto 1935; Mosca 1939; Aron 1950; Castles 1974; Putnam 1976; Huntington 1984). Higley and Burton (1989) attempted to form a new elite paradigm that explains regime change similarly. They contend, "A disunified national elite, which is the most common type, produces a series of unstable regimes that tend to oscillate between authoritarian and democratic forms over varying intervals. A consensually unified national elite, which is historically much rarer, produces a stable regime that may evolve into a modern democracy, as in Sweden, or Britain, or the United States, if economic and other facilitative conditions permit." Elites, however, both affect and are constrained by institutions.

Institutional theory takes the focus away from individuals and places it in the state. Theda Skocpol’s (1979) *States and Social Revolutions* leads the way for explanations of revolution in institutional theory. She argues that the existence of peasant groups is not enough to incite revolution. Prior regime type becomes a variable of interest, and its constraints determine whether it will be able to respond to changes. A “crisis of state” must occur in which elites divide over how to respond to the challenge, and the state weakens. It is only then that Skocpol’s second causal variable, “patterns of class dominance,” determines who will lead a revolution against the weakened state.

A renewal of interest in the more general effects of institutions occurred in the 1990s, which led to further studies of how institutions interact with society. Institutionalism posits that social phenomena are not only the result of the aggregation of individual behavior but also the result of the effect of institutions (Clemons & Cook 1999). It examines the effect of constraints on individual choice and behavior and the
interrelationships among formal rules, informal norms, social networks, and purposive action (Brinton & Nee 1998). These interrelationships have implications for durability and change in institutions. Clemons and Cook (1999) state, “Institutions endure to the extent that they are not disrupted by exogenous shocks such as war or so long as shifts in other opportunities do not lead individual actors and coalitions to defect from institutionalized arrangement.”

A relevant link forms between elite and institutional theory upon consideration of the predatory state, in which the elites manipulate the institutions in their favor in distinct ways. The predatory state acts only in the interest of elites rather than pursuing a cohesive strategy of economic development that benefits the greater society. Predatory states function by allocating rents, which are generally thought of as wealth a person does not create but instead gains by taking a larger share of a fixed amount of wealth. The most obvious source of rents is natural resources; however, rent-seeking behavior also can apply to exploitations in market imperfections, for example. When rents contract or are exhausted, the predatory state must find alternatives or face instability and challenges to its rule from within the elite circle. Thus, instability occurs when the cost of maintaining the regime grows faster than the growth of new rent-seeking opportunities (often in the form of resources). Richards (2008) states, “Regime instability will reveal itself in the form of some combination of fiscal crisis, civil unrest, and internal conflicts within the regime itself. When this instability reaches a critical level, the stage is set for transition.”

Elite and institutional theory place the focus on the rules governing society as well as those individuals that make the rules. Both offer an explanation that the failure of
a state, and the elites that hold power within it, to remain unified causes regime change. Institutional and elite theory offer the causal structure visually depicted in Figure 2: elite divisions cause regime change.

![Figure 2](image)

**Figure 2**
Elite & Institutional Breakdown Path to Regime Change

Modernization, relative deprivation, elite, and institutional theories (including consideration of the predatory state) offer a cohesive, macro-level view of regime change. The literature suggests two paths to regime change: mobilization and elite divisions, as shown in Figure 3. Understanding the way variables within these two paths interact is vital to achieving a comprehensive understanding of the failure of regimes.

![Figure 3](image)

**Figure 3**
Two Main Paths to Regime Change

In the next section, I outline interrelationships between the salient variables from each theoretical construct. First, modernization theory provides the variables of youth population and social networks and relative deprivation theory that of well-being and
ethnicity. These result in popular mobilization, which can lead to regime change. A second path to regime change follows elite and institutional theory by describing the role natural resources play in state fiscal capacity and a professional and autonomous bureaucracy. In this context, loss of monopoly on the use of force can lead to regime change. A separate trigger is the occurrence of an economic crisis, which can cause regime change when the other conditional variables are observed.

**A Directed Acyclic Graph (DAG) of Regime Change**

Figure 4 depicts a directed acyclic graph (DAG) of regime change. Beginning with modernization theory, the relevant variables include changing demographics, well being, and ethnicity as well as social networks, shown in the right hand side of the DAG. Changing demographics require adaptive institutions the state may not be able to readily provide due to different needs within a population. If the requirements of the population change, the state must reallocate resources to fulfill the new demands. Thus, changing demographics reduces stability (Lockhart et al 2010). It is often noted that youth have a tendency to be more idealistic or hopeful than older individuals. Therefore, they may see greater benefits for the future with the upheaval of a regime and may be more likely to fight for these changes against a current regime (Eisenstadt 1978). Similarly, this theory is often related to urbanization theory. It is unlikely that rural, disjointed youth could form a successful movement. However, it becomes easier for insurgency networks to contact and recruit youth when there is a large, centrally located youth population (Goldstone et al 2010, Lockhart et al 2010).
When people feel their lives are not as good as they should be and that the state is somehow responsible, their propensity to join a social movement rises. How to measure this concept has received a wide discussion in the literature. First, scholars have used measures of inequality to operationalize relative deprivation. However, several empirical models have found inequality to be an insignificant predictor of revolution (Goldstone, Bates, Epstein, Gurr, Lustik, Marshall, Ulfelder & Woodward 2010; Goldstone 2001; Lockhart, et. al. 2010; Gurr, Woodward & Marshall 2005). Another prominent argument in the literature has been that GDP per capita is the best indicator of well-being. Many scholars have argued to the contrary that GDP per capita is subject to extreme outlier
bias, particularly in resource-rich states, taking away its validity for a measure of well-being of a country as a whole. To combat the shortcomings of the GDP per capita measure, some instead have chosen to use infant mortality as a proxy measure of human development, since infant mortality can result from inadequate health care, nutrition, or even education (Ghani, Lockhart, & Carnahan 2006; Goldstone et al 2010; Prezworski et al 2000).

Ethnicity has also been the focus of a considerable amount of discussion and debate in the literature. This comes from the assumption that the distribution of resources is tied to ethnic group. Hypotheses in the literature range from general measures of ethnic polarization or fragmentation across the nation-state’s population to the rule by an ethnic minority as contributing to regime change. Ethnic groups have different preferences, and political cooperation may not be achieved in such a context due to the difficult prioritization of public goods, especially in poor states (Fearon & Laitin 1996, 2003; Collier & Hoeffler 2004; Bates 2008). Similarly, in minority rule, the taxes from the entire population largely benefit only the ruling majority (Bueno de Mesquita, Smith, Siverson, & Morrow 2003; Adam & O’Connell 1999). Instead of considering the preferences of other ethnic groups, minority ruling groups often attempt to repress them.

Changing demographics, lack of well-being, and ethnic diversity or minority rule create a population with “mobilization potential,” which refers to the propensity of members in society to be mobilized by a movement (Klandermans & Oegema 1987). An additional variable, however, is necessary for this to occur: social networks. Scholars of social movements have long recognized personal networks often draw participants into movements. Indeed, social networks condition which people may be targeted to join a
potential movement, and overlapping social networks extend the reach of the movement (Klandermans & Oegema 1987). While communication within social networks can occur through less personal means such as direct mail or mass media, these means are less likely to be successful in cases of high-risk, high-cost participation (McAdam 1986; Briet, Klandermans, & Kroon 1987). In these cases, friendship networks become even more important; people participate because someone with whom they have a personal connection asks or encourages them to do so. When ties are stronger among these people, participation is more likely due to higher social rewards of participation and costs of non-participation (Kitts 2000; McAdam 1986).

Changing demographics, lack of well being, or ethnic differences can spur a movement, and social networks can compound individual plight into group grievance. Once social networks have been exploited to gain participation in a movement, popular mobilization occurs. Society voices discontent with the state through various means. Peaceful means can include increased voter turnout during an election to indicate nonviolent protests and demonstrations or other methods of political participation, but it also can occur through more dramatic means such as strikes and riots. Popular mobilization often is marked by a coordinated campaign for political change by inciting as much of the public as possible to join in expressing the need for different policies, or in the case discussed here, the need for regime change.

The left side of the DAG features variables that focus on institutions and elites. Scholars have widely discussed the role of natural resources in the way the state’s institutions function, the payoff structure of the state’s elites, and the resulting effect of natural resources on coups and internal conflict (see Dunning 2005; Collier and Hoeffler
1998, 2000; Fearon 2005; Humphreys 2005; Lujala, Gleditsch, and Gilmore 2005; Collier, Hoeffler, and Soderbom 2004; Le Billon 2001; and Ross 2003, 2004). Collier and Hoeffler (1998) argue that natural resources affect the cost-benefit analysis of actors considering spurring internal conflict. These actors’ goals may be succession or state capture, and they make a cost-benefit analysis of paths to that goal. Costs of rebellion include the opportunity costs of the labor of participating actors and the costs incurred on the national economy because of the conflict. There is a probability of winning and obvious benefits associated with winning. Natural resources increase the benefits of either state capture or the succession of a resource-rich area from the national government because it gives leaders greater rent-seeking opportunities. Thus, while natural resources do not in and of themselves lead to regime change, but they set conditions by which groups may be more likely to pursue rebellion (Collier and Hoeffler 1998).

Natural resources increase the state’s fiscal capacity by providing a large source of revenue for the state to gain through taxation, borrowing, or other means. Accomplishing policy goals requires resources. States are likely more successful at accomplishing policy goals if they have more resources available to them (as through natural resources) or if they are better at tapping whatever the supply of resources through taxing and borrowing (Kocher 2010). Thus, if one assumes the goal of prominent actors within the state to be maintenance of power and position, a state with more access to resources will be more likely to be able to keep those actors in power. However, natural resource rents and revenues can be a volatile source of income and are
subject to price shocks, which can lead to sharp changes in fiscal capacity when natural resources represent much of the state’s income.

At the same time, natural resources increase the likelihood that the bureaucracy will neither be professional nor autonomous due to the opportunities for elite capture natural resources provide. The concept of a professional and autonomous bureaucracy is rooted in the methods by which bureaucrats are chosen and given credentials. A professional bureaucracy is comprised of bureaucrats who have been selected based on various forms of schooling or competitive examinations, and an autonomous bureaucracy is one in which bureaucrats cannot pass their offices to heirs. Predatory, or neo-patrimonial, states extort resources from society without providing corresponding benefits. Instead, a systematic privatization of the state occurs, in which public positions become competitive vehicles to exploit resources rather than agencies for the service of society (Kocher 2010).

If a regime, however, loses its fiscal capacity for some reason, its monopoly on the use of force will likely also be lost due to the inability to maintain the military. An unprofessional and non-autonomous bureaucracy may also increase the probability of the state’s loss of monopoly on the use of force because of the uninstitutionalized relationships that may be more prone to factioning if elites become disgruntled with the distribution of rents. With an unprofessional bureaucracy, it may be more likely that an elite or group of elites can take control of part of the military, causing the state to lose its control of force.

Bates (2008) defines this loss of the monopoly on the “means of coercion” to be a key characteristic of a failing or failed state. Weber (1946) first introduced this concept
with this contention that the state is the entity that “upholds the claim to the monopoly of
the legitimate use of physical force in the enforcement of its order.” Levy (2007) and
Kasfir (2004) put the notion into the context of a realist perspective on internal conflict
by describing the security dilemma that takes place within national borders. When the
state loses its monopoly on the use of force, groups bear arms to compete for political
power. Individuals must look to these groups for the security the state can no longer
provide. Kasfir (2004) goes into greater detail by describing this as a dynamic process in
which individuals do not change their perception of authority quickly or all at once; they
do so at different times and for different reasons. While some join movements solely out
of fear for their own security, others join because they see the possibility to gain power or
loot economic resources through an affiliation to an armed group. Thus, political parties
transform from peaceful players following institutional rules to armed groups vying for
power (Bates 2008). Once the regime is challenged by force, the likelihood of regime
change heightens.

Another argument made in the literature is that while the individual and structural
variables stated here facilitate regime change, they do not consider the processes that
actually bring it about and thus do not fully explain its causes (Rustow 1970).
Gasiorowski (1995) posits that “momentous contemporaneous events” trigger the
processes of regime change and act in conjunction with the background conditions, which
magnify the effect of these events on regime change. While Gasiorowski admits that
there are several types of events that could constitute such a momentous change, he
focuses on economic crisis. Economic crises can challenge the legitimacy of regimes and
trigger regime change (Epstein 1984; Richards 1986; Markoff and Baretta 1990).
The literature on stability also includes several hypotheses that lie outside these theoretical approaches. Some authors argue that countries with a history of instability are more likely to experience instability in the future. Violent uprisings usually result in the country having a strong military infrastructure as well as the presence of military equipment outside the hands of the government, which would make it easier for a new popular movement to obtain weapons (Lockhart et al 2010). The same basic theory applies to a history of social movements: if a country has had a great number of social movements in the past, the organizational structure for another movement is more easily created (Useem and Useem 1979). Another theory that lies outside these approaches comes from the Political Instability Task Force among others: political instability is more likely to occur in a state if it is present in neighboring states. Instability in a region may result in unpredictable and possibly unregulated flows of people as well as a restriction of normal economic activities, such as resource trade, thus leading to instability within the state itself (Goldstone et al 2010). I choose not to examine these hypotheses and instead focus on the internal processes by which regime change occurs. The hypotheses listed above pertain to either static variables (e.g., history) or variables external to the state itself (e.g., unstable region).

**Specifying the Models**

On the basis of the DAG in Figure 4, I specify two models. The first simply asks the question of what causes the dependent variable of regime change. According to the logic of the DAG, one must include the “parent” variables of regime change in this model. These are the independent variables directly connected to the dependent variable:
popular mobilization; monopoly on the use of force; and economic crisis. These three parent variables account for the causal effect of the other independent variables since the others relate to the parent variables. Therefore, adding the others to the model biases the estimates. For this reason, the common practice within quantitative social science of adding new, interesting variables to regression equations is problematic. This was recognized as early as 1899 by Karl Pearson in what is now called “Simpson’s paradox,” which states that a statistical relationship between two variables may be reversed by including additional factors (Pearl 2000). Specifying the model using the logic of the DAG lends to integrity in including the true causal variables.

To fully scrutinize whether I correctly identify the relationships between other independent variables in the DAG, I test another model to examine those in the left side of the DAG: natural resources; state fiscal capacity; and professional and autonomous bureaucracy. In the second model, I test for the effect of state fiscal capacity on the dependent variable. The natural resources variable has a causal effect on state fiscal capacity but also on professional and autonomous bureaucracy, which then have causal effects on monopoly on the use of force. This means a path, called the back door, exists from state fiscal capacity with the potential to create a confounding bias. Because of this, I must condition on, or measure, one of the variables through which the back-door path exists in order to “block” the path and remove the confounding bias. In model two, I include the professionalism and autonomy of the bureaucracy to achieve this (see Pearl 2000 for more discussion on the back-door criterion).
Data & Method

Measuring regime change has incited its own discussion in the literature. Regime change variables have been coded in a variety of ways, from the various degrees of democracy or autocracy (Polity IV, Freedom House, etc.) to simply defining a dichotomous variable of democracy or autocracy. It is important to find a balance between these two extremes in which the variable is still a simple categorization of regimes, which allows authors to meaningfully study regime change, but can also capture the fact that a regime does not always fit a dichotomous measure. I use the Diplomacy and Dictatorship Revisited dataset for the dependent variable, which uses a six-fold regime classification: parliamentary democracy; mixed (semi-presidential) democracy; presidential democracy; civilian dictatorship; military dictatorship; and royal dictatorship (Cheibub, Gandhi, & Vreeland 2009). The frequency table, which outlines the distribution of the observations over these categories, can be found in Appendix A. However, I am interested not in which regime the country is coded, rather, the occurrence of a change from one regime type to another. Using the regime classification, I code the dependent variable to be a dichotomous variable in which zero signifies regime change did not occur in that year and one signifies it did occur. Table 1 reports the central tendencies for this variable. Figure 5 shows the regime survival rate over time, which depicts a slight but steady decline in the survival rate over time.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regime Change</td>
<td>.0552</td>
<td>0</td>
<td>.2285</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
In the first model, I measure the effect of economic crisis, loss of monopoly on the use of force, and popular mobilization on the dependent variable. Central tendencies for these variables are reported in Table 2. I measure economic crisis using inflation data from the International Macroeconomic Dataset of all countries for the years 1969-2008. Negative changes in inflation indicate recessionary crises. The inflation rate ranges from 0 to 205.83. The mean is 49.536, and the median is 47.05. While the proximity of these suggests somewhat normally distributed data, the standard deviation of 38.940 indicates a high variation in the data.

I measure the loss of monopoly on the use of force by the presence of other violent and armed actors using the Political Instability Task Force’s dataset on revolutionary wars. This variable measures the average magnitude of violence associated...
with a revolutionary conflict based on the number of combatants or activists, and the number of fatalities related to fighting, the proportion of the country affected by fighting. The scale ranges from zero to four (both theoretically and actually). The median is zero and the mean is .1428962, indicating that there are many country-years in which violence is not taking place at all.

Table 2
Central Tendencies of Magnitude of Violence, Inflation, and Urbanization Rate

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation</td>
<td>49.536</td>
<td>47.05</td>
<td>38.940</td>
<td>0</td>
<td>205.83</td>
</tr>
<tr>
<td>Magnitude of Violence</td>
<td>.1428</td>
<td>0</td>
<td>.6262</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Urbanization Rate</td>
<td>3.014</td>
<td>2.841</td>
<td>2.6223</td>
<td>-43.186</td>
<td>19.733</td>
</tr>
</tbody>
</table>

Due to availability of data I use a proxy measure for popular mobilization: urbanization rate. Urban areas allow social networks to form and movements to grow more rapidly due to quicker communication channels and perhaps fewer opportunity costs to participating in a movement than in rural areas where communication and travel could be difficult. I use the World Bank’s measure for urbanization rate, which ranges from -43.18695 to 19.73348. The proximity of the mean (3.014972) to the median (2.841128) suggests outliers do not have a large effect on the mean.

In the second model, I measure the effect of state fiscal capacity and the professionalism/autonomy of the bureaucracy on the dependent variable. Central tendencies for these variables are reported in Table 3. I follow Fearon and Laitin (2003) by using per capita income as a proxy for state fiscal capacity (the authors represent it as
a proxy for state power in general, but state power is based in its fiscal capacity). Income per capita, measured in 2005 U.S. dollars, ranges from a minimum of 28.42 to a maximum of 87910.66. The distance of the mean (7053.351) to the median (2209.72) indicates an outlier bias. The outlier with the maximum value is Luxembourg in the year 2008.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Income Per Capita</td>
<td>7.709</td>
<td>7.700</td>
<td>1.600</td>
<td>3.347</td>
<td>11.384</td>
</tr>
<tr>
<td>Regulation of Participation</td>
<td>3.580</td>
<td>4</td>
<td>1.073</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

I also resort to a proxy for a professional and autonomous bureaucracy: Polity IV’s regulation of participation variable. This variable measures “the extent that there are binding rules on when, whether, and how political preferences are expressed.” This variable is coded one to five; one signifies an unregulated system in which political groupings often form around “particular leaders, regional interests, religious or ethnic or clan groups, etc.” and five signifies stable political groups and processes in which groups are not excluded from political action. As the regulation of participation variable increases, it is logical to expect that bureaucracies become more professional and autonomous alongside stable political groupings and institutions. Regulated regimes should have rules not only for who participates in an elected position, but also for who holds a bureaucratic position. The mean of this variable is 3.580054 and the median is 4.

---

1 Central tendencies and model results for income per capita without log can be found in Appendix B.
I examine both parametric and non-parametric methods to test the models. Parametric models make assumptions about the distribution of the data while non-parametric models do not. Non-parametric methods employ maximum likelihood estimation (MLE) to examine patterns and correlates of their occurrence, taking into account the effect of time. This lends itself well to the subject of regime change because it estimates the independent variables’ effect on the probability of regime change without assuming anything about the structure of the probability curve over time. Event history analysis is generally used to define events by their duration and determine hazard ratios for each independent variable\(^2\); however, the discrete nature of regime change lends itself better to time duration (also called discrete-time event history) models.

There are several ways in which to pursue time duration models, but logistic regression is a popular choice for discrete-time data due to empiricists’ familiarity with the method. First, I provide results for basic logistic regression for robustness. Two forms of logistic regression in particular, however, especially fit discrete-time data. Both fixed effects and random effects logistic regression recognize the data is discrete-time and offer a non-parametric estimation that takes the effect of time into account without assuming anything about the distribution\(^3\). The two models differ in that while they both take into account the effect of time, the fixed effects model also accounts for collinearity in panels. In doing so, it identifies countries that had no instances of regime change (i.e., the dependent variable is coded “0” for all years for that country) and drops them from the model. While this preferable to the model itself, as will show in the log likelihoods of

---

\(^2\) I examined Weibull, exponential, and Gompertz distributions for fit and the Cox proportional hazards model before determining these methods were not best suited to the data.

\(^3\) Both methods use Stata’s `xtlogit` command, which requires a prior command, `xtset`, to recognize the data as time-discrete. The command options `fe` and `re` then direct the model to estimate fixed or random effects, respectively.
each in the following Results section, there may be some interesting implications for the observations fixed effects drops and their effect on the coefficients and standard errors. For this reason, I also include and interpret the results for the random effects model.

**Results**

I test each set of variables with three logistic regression models and report the results in Tables 4-7. The first set of models is relatively consistent. The probability of the chi-squared is .0000 for all models, which suggests the statistical significance of models.

<table>
<thead>
<tr>
<th>Table 4</th>
</tr>
</thead>
</table>

**Results of Logistic Regression, Fixed Effects Logistic Regression, and Random Effects Logistic Regression Regressing Regime Change on Magnitude of Violence, Inflation, and Urbanization Rate**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Logistic Regression</th>
<th>Fixed Effects Logistic Regression</th>
<th>Random Effects Logistic Regression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnitude of Violence</td>
<td>.2120312** (0.0715634)</td>
<td>.3559345** (0.1103032)</td>
<td>.2661809** (0.0864978)</td>
</tr>
<tr>
<td>Inflation</td>
<td>-.0107127** (0.0019125)</td>
<td>-.0133766** (0.0023227)</td>
<td>-.0116505** (0.002067)</td>
</tr>
<tr>
<td>Urbanization Rate</td>
<td>-.0151689 (0.0222356)</td>
<td>-.024859 (0.0260607)</td>
<td>-.0250378 (0.0234737)</td>
</tr>
<tr>
<td>Constant</td>
<td>-2.738627** (1.288906)</td>
<td></td>
<td>-2.871873** (1.532482)</td>
</tr>
<tr>
<td>N</td>
<td>6203</td>
<td>4275</td>
<td>6203</td>
</tr>
<tr>
<td>Prob &gt; Chi²</td>
<td>.0000</td>
<td>.0000</td>
<td>.0000</td>
</tr>
<tr>
<td>Log Likelihood</td>
<td>-1014.19</td>
<td>-712.61857</td>
<td>-999.05068</td>
</tr>
</tbody>
</table>

Notes: * p<.05, **p<.01 Standard error is in parentheses.
I report the basic logistic regression as a robustness test, but it does not account for the
effect of time or panels and thus will not be a focus of the interpretation of the results.
Based on log likelihoods alone, it appears that the fixed effects logistic regression fits the
data best. Because the fixed effects logistic regression eliminates almost 2,000
observations from the model (i.e., those panels in which the dependent variable does not vary), it may be eliminating interesting cases within the independent variables. For this
reason, I also include the results of the random effects logistic regression, which also
accounts for time and panels but does not drop panels due to lack of variance.

Both find the magnitude of violence to be a significant predictor of regime change at the 99% confidence level. The fixed and random effects produce notably different coefficients for this variable, which the odds ratios, reported in Table 5, then reflect. The fixed and random effects models indicate that a one-unit increase (on the scale of zero to four) in the magnitude of violence results in a 43% or 30%, respectively, greater probability of regime change.

### Table 5

<table>
<thead>
<tr>
<th>Variable</th>
<th>Logistic Regression</th>
<th>Fixed Effects Logistic Regression</th>
<th>Random Effects Logistic Regression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnitude of Violence</td>
<td>1.2361</td>
<td>1.4275</td>
<td>1.3049</td>
</tr>
<tr>
<td>Inflation</td>
<td>0.9893</td>
<td>0.9867</td>
<td>0.9884</td>
</tr>
<tr>
<td>Urbanization Rate</td>
<td>0.9849</td>
<td>0.9754</td>
<td>0.9752</td>
</tr>
<tr>
<td>Constant</td>
<td>0.0646</td>
<td>0.9754</td>
<td>0.05659</td>
</tr>
</tbody>
</table>
Both also suggest a negative, statistically significant relationship at the 99% level between the inflation rate and regime change. The interpretation of the coefficients indicates that 1% decrease in the inflation rate results in a 1.3% or a 1.2% (fixed and random, respectively) greater probability of regime change. This result suggests deflationary crises put regimes in greater danger of failure. The urbanization rate was not significant in the model.

The second set of models provides slightly more variation. Again, basic logistic regression serves as a robustness test, and the probability of the chi-squared is .0000 for the basic logistic regression and random effects models, an indicator of the models’ statistical significance. The probability of the chi-squared is .0150 for the fixed effects model. The regulation of participation variable has a statistically significant, negative relationship at the 99% level across the different models. The odds ratios of the fixed and random effects models indicate that a one-unit decrease in the regulation of participation (on the scale of one to five) results in a 26% or 29% increase, respectively, in the probability of regime change.

The second independent variable in the models, income per capita, is statistically significant at the 99% level in the random effects regression but is not significant in the fixed effects model. The reason for the widely different estimates in each model lies in the countries that the fixed effects model drops due to lack of variation in the dependent variable.
Table 6  
Results of Logistic Regression, Fixed Effects Logistic Regression, and Random Effects Logistic Regression Regressing Regime Change on Logged Income Per Capita Controlling for Regulation of Participation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Logistic Regression</th>
<th>Fixed Effects Logistic Regression</th>
<th>Random Effects Logistic Regression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulation of Participation</td>
<td>-0.339384**</td>
<td>-0.3016729**</td>
<td>-0.343317**</td>
</tr>
<tr>
<td></td>
<td>(.0758037)</td>
<td>(.1065072)</td>
<td>(.0802381)</td>
</tr>
<tr>
<td>Logged Income Per Capita</td>
<td>-0.2330744**</td>
<td>-0.160525</td>
<td>-0.237002**</td>
</tr>
<tr>
<td></td>
<td>(.0547842)</td>
<td>(.2761937)</td>
<td>(.0604002)</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.959729**</td>
<td></td>
<td>-2.018824**</td>
</tr>
<tr>
<td></td>
<td>(.2372075)</td>
<td></td>
<td>(.2575164)</td>
</tr>
<tr>
<td>N</td>
<td>5413</td>
<td>3435</td>
<td>5413</td>
</tr>
<tr>
<td>Prob &gt; Chi²</td>
<td>.0000</td>
<td>0.0150</td>
<td>.0000</td>
</tr>
<tr>
<td>Log Likelihood</td>
<td>-780.4243</td>
<td>-561.3454</td>
<td>-778.67769</td>
</tr>
</tbody>
</table>

Notes: * p<.05, **p<.01 Standard error is in parentheses.

Many of the countries at the top of the range of income per capita, such as Luxembourg, Norway, and Iceland among others, also have no instances of regime change and are thus dropped from the model. This greatly changes the central tendencies of the income per capita variable and explains the difference in statistical significance to the model. This difference, in fact, may provide support for the hypothesis since these countries’ high per capita incomes may explain their lack of regime changes, but the fixed effects model cannot show this. The interpretation of the odds ratio of the random effects model does not provide much clarity on the issue due to the small size of an income per capita unit ($1). It suggests that with each $1 decrease in income per capita, the probability of regime change rises .01%.
Table 7
Odds Ratios of Logistic Regression, Fixed Effects Logistic Regression, and Random Effects Logistic Regression Regressing Regime Change on Logged Income Per Capita Controlling for Regulation of Participation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Logistic Regression</th>
<th>Fixed Effects Logistic Regression</th>
<th>Random Effects Logistic Regression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulation of Participation</td>
<td>0.7122</td>
<td>0.7395</td>
<td>0.7094</td>
</tr>
<tr>
<td>Income Per Capita</td>
<td>0.9999</td>
<td>1.0000</td>
<td>0.9999</td>
</tr>
<tr>
<td>Constant</td>
<td>0.1408</td>
<td></td>
<td>0.1328</td>
</tr>
</tbody>
</table>

Interpreted on a wider scale, however, the results are quite shocking; they indicate that the country-year at the minimum income per capita (Zimbabwe in 2008) is almost 880% more likely to experience regime change than the country-year at the maximum of the range (Luxembourg in 2008).

**Conclusions and Implications: A Way Ahead**

The model provides support for many of the relationships between the variables specified in the directed acyclic graph (DAG) derived from theory on regime change. The first set of models includes the parent variables of regime change in the DAG and indicates that the magnitude of violence (in other words, the state’s loss of the monopoly on the use of force) is a statistically significant predictor of regime change. This result suggests that intense internal conflicts between the state and another armed group often lead to regime change. Inflation rate is also statistically significant in the model. However, while it may seem intuitive that inflationary crises would lead to regime change,
change, it is actually deflationary crises that increase its probability. Both of these variables are easy to observe in the international community and may provide early warning to regime changes. The third variable in the first set of models, urbanization rate, serves as a proxy for popular mobilization and is not statistically significant. A better way to operationalize this variable would be through a measure of nonviolent, public demonstrations; however, these data are not readily available to researchers for the time period in this study. Following the logic of the DAG, one can also measure a variable “higher” in the DAG, which could also be a viable option.

I test for the effect of the state’s fiscal capacity in the second set of models and, thus, include a measure for the professionalism/autonomy of the bureaucracy. I operationalize them with the proxy variables of income per capita and regulation of participation, respectively. Regulation of participation has a statistically significant effect on regime change. As it decreases, and thereby participation in state institutions increasingly depends on “particular leaders, regional interests, religious or ethnic or clan groups, etc.,” the likelihood of regime change increases. Groups of elites tied by these rather than by formal rules and ideologies may have more incentive to faction when greater payoffs exist for doing so, which then increases the likelihood of an armed opposition and, thus, regime change.

The fixed and random effects models estimated the impact of income per capita on regime change differently. The fixed effects model, which dropped almost 2,000 observations, did not estimate a statistically significant effect, unlike the random effects model (as well as the basic logistic regression). All of those observations that are dropped record no regime changes for the time period of the study. While this is
statistically troublesome for the model, there may be something to learn from the values of the independent variables in those countries that experience no regime changes over the time period. The countries with no regime changes most likely correlated to those with high incomes per capita.

Separating the variables into two models to test various relationships and avoid confounding bias aligns with Pearl’s (2000) logic on causality and DAGs and is necessary due to availability of data. However, the preferable test of the DAG is to measure all variables and test a hierarchical or structural equation model. A hierarchical model tests for statistical significance of smaller, nested models within larger models and thus can test for whether relationships exist at every causal level from the root variables to the dependent variable. Structural equation modeling (SEM) is largely confirmatory and includes the subset of path analysis. Both of these options require all variables in the model to be measured.

In addition to considering new methods of analyzing the DAG, one must also consider the implications of the current uprisings in the Middle East and North Africa. While published data limit this study’s currency to 2008, in the coming years, data will be published to reflect the dynamic processes of regime change occurring in the present. These studies will focus largely on the role of social media as a tool of organization and mobilization. Work in harnessing the predictive power of using social media to measure the frequency of certain key words or phrases and its effect on the success of regimes has already begun in government, NGOs, and government contractors due to the saliency of the topic. The role of academic researchers in this endeavor will be to provide the explanation and empirical tests of regime change from a theoretical perspective.
Systemic, macro-level explanations of how variables interact on the whole lay the groundwork within which to incorporate new data. A strong understanding of the complete picture of regime change theory is necessary in anticipation of the ways in which the current regime upheavals will affect the research agenda.
Appendix A

Regime Type Coding and Frequency

<table>
<thead>
<tr>
<th>Coding</th>
<th>Regime Type</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Parliamentary Democracy</td>
<td>24%</td>
</tr>
<tr>
<td>1</td>
<td>Mixed (Semi-Presidential) Democracy</td>
<td>8%</td>
</tr>
<tr>
<td>2</td>
<td>Presidential Democracy</td>
<td>12%</td>
</tr>
<tr>
<td>3</td>
<td>Civilian Dictatorship</td>
<td>29%</td>
</tr>
<tr>
<td>4</td>
<td>Military Dictatorship</td>
<td>19%</td>
</tr>
<tr>
<td>5</td>
<td>Royal Dictatorship</td>
<td>9%</td>
</tr>
</tbody>
</table>

N = 9,115  
Regime Failures = 501  
Regime Duration Range = 1-139 years

Appendix B

Central Tendencies of Income Per Capita and Regulation of Participation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income Per Capita</td>
<td>7053.351</td>
<td>2209.72</td>
<td>11286.55</td>
<td>28.42</td>
<td>87910.66</td>
</tr>
<tr>
<td>Regulation of Participation</td>
<td>3.580</td>
<td>4</td>
<td>1.073</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

The benefits of using the logged measure of income per capita are clear from its central tendencies; the range and standard deviation are reduced drastically, and the mean shows a close proximity to the median. However, the logged measure affects the significance of the constant, which was significant at the 99% level in the models without the logged income per capita. The fixed effects model also shows a slightly higher probability of the chi-squared: while the significance of the model is still above the 95% level, it is no longer above the 99% level.
Results of Logistic Regression, Fixed Effects Logistic Regression, and Random Effects Logistic Regression Regressing Regime Change on Logged Income Per Capita Controlling for Regulation of Participation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Logistic Regression</th>
<th>Fixed Effects Logistic Regression</th>
<th>Random Effects Logistic Regression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulation of Participation</td>
<td>-0.4125653**</td>
<td>-0.3048496**</td>
<td>-0.4107417**</td>
</tr>
<tr>
<td></td>
<td>(0.0731976)</td>
<td>(0.1070283)</td>
<td>(0.0775023)</td>
</tr>
<tr>
<td>Income Per Capita</td>
<td>-0.0000612**</td>
<td>-0.0000355</td>
<td>-0.0000595**</td>
</tr>
<tr>
<td></td>
<td>(0.0000169)</td>
<td>(0.0000433)</td>
<td>(0.0000174)</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.2692372</td>
<td></td>
<td>-0.312376</td>
</tr>
<tr>
<td></td>
<td>(0.4355521)</td>
<td></td>
<td>(0.4769396)</td>
</tr>
<tr>
<td>N</td>
<td>5413</td>
<td>3435</td>
<td>5413</td>
</tr>
<tr>
<td>Prob &gt; Chi²</td>
<td>.0000</td>
<td>.0150</td>
<td>.0000</td>
</tr>
<tr>
<td>Log Likelihood</td>
<td>-780.91322</td>
<td>-561.3454</td>
<td>-779.18763</td>
</tr>
</tbody>
</table>

Notes: * p<.05, ** p<.01 Standard error is in parentheses.
Bibliography


Cheibub, José Antonio, Jennifer Gandhi, & James Raymond Vreeland. 2009. *Democracy and Dictatorship Revisited Codebook*.


Ross, Michael L. 2003. “Oil, Drugs, and Diamonds: How do Natural Resources Vary in the Impact on Civil War?” In *Beyond Greed and Grievance: The Political*


Skocpol, Theda. 1979. *States and Social Revolutions*. Cambridge: Cambridge University Press.

