Centralized institutions and cascades

Rubin, Jared

Chapman University

7 July 2011

Centralized Institutions and Cascades*

JARED RUBIN†

Chapman University

May 29, 2012

Abstract

Why do sudden and massive social, economic, and political changes occur when and where they do? Are there institutional preconditions that encourage such changes when present and discourage such changes when absent? I employ a general model which suggests that cascades which induce massive equilibrium changes are more likely to occur in regimes with centralized coercive power, defined as the ability to impose more than one type of sanction (economic, legal, political, social, or religious). Centralized authorities are better able to suppress subversive actions when external shocks are small, as citizens have little incentive to incur numerous types of sanctions. However, citizens are also more likely to lie about their internal preferences in such regimes (e.g., falsely declare loyalty to an oppressive government), entailing that larger shocks are more likely to trigger a cascade to a vastly different equilibrium. The model is applied to the severity of protests that followed austerity measures taken in developing nations since the 1970s.

---

*I am extremely grateful to Andy Gill, Avner Greif, Kristin Kleinjans, Timur Kuran, Michael Makowsky, and Jonathan Meer for their extremely helpful insights. Comments received at seminars at Duke's "Islam and Economic Development" Conference, Cal State Fullerton, and the UC Berkeley Political Science Seminar were also quite useful. All errors are mine.

†E-mail: jrubin@chapman.edu; Address: Argyros School of Business and Economics, Chapman University, One University Drive, Orange, CA 92866

1 Introduction

Economists, political scientists, and sociologists are well aware that small events may act as a spark which leads to a significant change in equilibrium outcomes. Granovetter (1978) was amongst the first to argue that cascades can arise when individuals' preferences are interconnected - if enough people take some action it encourages others to do the same, which encourages more to do the same, and so on until a vastly different equilibrium results. In some cases, small events encourage some individuals to publicly reveal their previously suppressed, privately held preferences, which leads to information revelation or changes in status, in turn resulting in starkly different equilibria (Granovetter 1978; Oliver, Marwell, and Teixeira 1985; Kuran 1989, 1991, 1995a, 1995b, 1998; Macy 1991; Bernheim 1994; Yin 1998; Kuran and Sunstein 1999; Kuran and Sandholm 2008). In other instances, such events act as a signal in the decision process, leading to social learning phenomena such as herd behavior and informational cascades that encourage individuals to ignore their private information and follow the actions of others (Banerjee 1992, 1993; Bikhchandani, Hirshleifer, and Welch 1992, 1998; Lohmann 1994; Callander 2007; Watts and Dodds 2007; Siegel 2009; Ellis and Fender 2011).[1]

The theoretical and experimental literature in economics focuses primarily on how the interactions amongst agents precipitates cascades, but provides little macroeconomic or institutional conditions under which such behavior is likely to arise (Anderson and Holt 1997; Banerjee 1992, 1993; Bikhchandani, Hirshleifer, and Welch 1992, 1998; Çelen and Kariv 2004; Kübler and Weizsäcker 2004, 2005; Goeree et al. 2007; Alevy et al. 2007).[2] The works which do study the institutional conditions under which such behaviors emerge focus primarily on the role that social or political sanctions play in suppressing private opposition to a regime (Kuran 1989, 1995a; Lohmann 1994; Rasler 1996; Slater 2009).

Yet, by merely focusing on the political structures in which such phenomena arise, it is possible to overlook the general microeconomic settings under which these behaviors are facilitated. This paper aims to shed light on these settings, formulating a general model which applies to all types of sanctioning authority (economic, legal, political, social, or religious). It extends on the works cited above, suggesting that cascades

[1] Oliver (1993) provides an overview of the sociological advances made in this literature in the 1980s and early 1990s. Sushil Bikhchandani, David Hirshleifer, and Ivo Welch have organized a website, http://www.info-cascades.info/, which provides a literature review and links, as of 2004, to articles on information cascades.

[2] Ellis and Fender (2011) consider the role that information cascades play in revolutionary regime transition, but they model the two phenomena separately instead of intergrating the two.

which induce massive economic, social, or political changes may be one consequence of an institutional arrangement in which one type of authority has multi-lateral coercive power - that is, the ability to affect sanctions over numerous dimensions. I formulate a model with three types of agents: a group of citizens and two different institutional authorities. The latter players can be thought of as religious authorities, political figures, social icons, or legal authorities. One of the authorities is a "central" authority, with the degree of centralization being the level of the cost imposed on the other authority for transgressing the central authority's dictates.[3]

Previous works have focused on "central authorities" primarily in a political context, as the most obvious examples come from the political world. For example, political, economic, and religious power in Iran is "centralized" in the religious establishment. It is costly for political or economic leaders to openly violate the dictates of religious authorities, which implicitly gives the religious authorities power over numerous types of sanctions. The same could be said about the leaders of the Communist Party in China or for the autocratic Arab dictators (e.g., Mubarak, Khadafi) who faced major protests (for reasons highlighted in this model) in the Arab Spring of 2011. Yet, the same also could be said for the medieval Church, which controlled numerous aspects of one's life, especially for members of the Church, before facing major protests during the Reformation.[4]

The model analyzes the interactions between citizens and the authorities under the situation where the preferences of the latter are not aligned with those of the former. Citizens derive intrinsic utility from their own actions and have sanctions imposed on them for publicly rejecting (i.e., protesting) the actions of the two institutional authorities. These actions could represent any number of phenomena in which the desires of some citizens diverge from those of institutional authorities, such as speaking or writing freely, having more than one child, or practicing minority religions. Citizens' utility is also *interdependent* with other citizens

[3]Throughout this paper, I use the term "centralized" to indicate the degree to which coercive power over sanctions affecting different aspects of one's life (e.g., political, religious, social) is concentrated in one authority. This is similar to the structure recently proposed by Slater (2009), who looks at the role that the separation between political elites and communal/religious elites plays in revolution mobilization. This is a broader definition than ones normally used in the political science and political economy literature, which frequently focus on federalism, administrative centralization, fiscal centralization, or democratic centralization (for example, see Rondinelli [1981] or Manor [1999]). Any of these forms of centralization fit into the model espoused in this paper, although my focus is the costs imposed by authorities, not the institutional structures themselves.

[4]Rubin (2012) suggests that the mechanism proposed in the present paper played a key role in the Reformation, as the printing press facilitated the spread of the "shock" of Luther's initial works, leading to a cascade of revolt.

(as in Granovetter 1978; Oliver, Marwell, and Teixeira 1985; Oliver and Marwell 1988; Marwell, Oliver, and Prahl 1988; Macy 1991; Kuran 1995; Kim and Bearman 1997; Yin 1998; Callander 2007; Siegel 2009; Ellis and Fender 2011).[5] That is, they derive disutility when their actions differ from endogenously determined social norms, which may arise from the importance individuals place on social identity (Akerlof and Kranton 2000, 2005), social custom and reputation (Akerlof 1980; Romer 1984; Kuran 1989, 1998; Naylor 1990; Gould 1993; Kuran and Sunstein 1999), or status and conformity (Fershtman and Weiss 1993; Bernheim 1994; Fershtman, Murphy, and Weiss 1996; Akerlof 1997; Kuran and Sandholm 2008).

This setup entails that highly-centralized authorities - those with coercive power over more than one type of sanction - are *more insulated* from pressures for change when exogenous shocks are small. There is less incentive for citizens to violate the dictates of highly-centralized authorities, as they incur more than one type of sanction from doing so. In turn, equilibrium actions remain stable.

However, this logic also entails that citizens are more likely to stay silent (i.e., not protest) when authority is highly centralized. Hence, massive changes in equilibrium actions are more likely to result in centralized regimes when a sufficiently large shock occurs. When a small portion of society transgresses the law (or norm, or custom, etc.), a cascade to a vastly new equilibrium can arise when the actions of these citizens encourages more citizens to transgress the law, which encourages even more to evade the law, and so on. This occurs to a lesser extent when authority is less centralized, as authorities are more likely to accommodate the actions of the citizenry, and preferences are therefore less likely to be falsified prior to the shock. Hence cascades are less severe (if they occur at all) in more decentralized economies.

In other words, this is a tipping point model. When shocks are small, centralized authorities are more insulated from change. However, when shocks are larger than the tipping point, equilibrium changes are larger in economies with highly-centralized authorities.[6] One implication of this hypothesis is that institutional authorities with centralized, multi-lateral coercive power may *seem* insulated from upheaval when in fact they are quite vulnerable. Because of this underlying vulnerability, authorities in such societies often do anything to suppress large shocks - or *communication* about large shocks - such as suppressing and controlling media

[5] This differs from the standard economic framework put forth by Olson (1971) and Tullock (1971), where individuals maximize their own utility independent of others. This property permits Olson and Tullock to suggest that collective action is difficult to sustain in large groups, but their observation is contradicted numerous times in the historical record.

[6] Yin (1998) makes a similar point relating shock level to protest scale, but is more concerned with threshold distribution than the interaction between protesters and authorities.

and harshly combating dissent. This can explain, for example, the extreme measures taken to suppress the internet in Iran and China. Such tactics work well to suppress small shocks. However, this also works to further push the actions of the citizenry away from their intrinsic preferences, which may eventually cause a larger cascade and thus unintentionally sow the seeds of the authority's demise. Although this paper is not meant to be predictive,[7] it has significant implications for the fate of future of contemporary centralized regimes (e.g., Syria, Zimbabwe, North Korea) following systemic shocks such as major changes in the price of oil or grain or a natural disaster.[8]

This paper relates to the large economic, sociological, and political science literature in revolutions.[9] The present paper is not meant to accept or deny the validity of any of these arguments, but instead offers a complementary hypothesis. I do not account for the organizations or leadership that are often instrumental to revolutionary activity (or even civil war, as in Besley and Persson [2011]), but instead provide a mapping from broad institutional structure to massive social, political, and economic change.

Historical examples of massive and unexpected changes occurring in centralized regimes include the fall of the Libyan, Egyptian, and Tunisian governments in the Arab Spring of 2011, the Iranian Revolution of 1979, the Bolshevik Revolution of 1917, the Taiping Rebellion in China (1850-1864), the fall of Iron Curtain governments, the Protestant Reformation, and many others.[10] In this paper, I employ the insights of the model to analyze the numerous austerity protests which occurred in the developing world since the 1970s. An econometric analysis of these protests from 1976-1992 suggests that protests were more severe under

---

[7]The model could certainly be employed in a predictive manner similar to Bueno de Mesquita (2009). This would require calibration of the model's parameters and is outside the scope of this paper.

[8]It may also be true that the type of policies taken by centralized governments exacerbate shocks to a greater extent than non-centralized governments (for a recent example, see Meng, Qian, and Yared [2010]; for more on centralization and distribution of public goods, see Lockwood [2002], Besley and Coate [2003], and Faguet [2004]). Where this is the case, the implications of the model for centralized governments are even greater.

[9]The mechanism underlying revolutionary activity in the present paper is closest to Kuran (1989, 1995a, 1995b), who analyzes the implications of public revelations of private preferences. For overviews of the social analysis of revolutions, see Tanter and Midlarsky (1967), Shugart (1989), and Goldstone (1994, 2001).

[10]For more on the broad effects of the centralization of coercive power throughout world history, see Greif (2005). Iyigun (2009) argues that there is a positive connection between monotheism and the length and bredth of dynastic power, as monotheistic religions have generally been complementary to centralized government (due to high fixed costs of starting a monotheistic religion). This argument is consistent with the one made in the present paper.

decentralized authorities if they followed small shocks (proxied by indices of IMF involvement), but were more severe under centralized authorities if they followed large shocks.

2 The Model

2.1 Setup

Consider a one-period game with perfect information. There are $M + 2$ players (where M is large): M heterogeneous citizens and two institutional (social, political, economic, legal, or religious) authorities, a central authority (C) and a non-central authority (N).[11] The institutional authorities choose from a continuous set of actions which the citizens can publicly accept or reject. The model analyzes situations in which the preferences of some citizens exogenously differ from those of the authorities, so actions could represent varying levels of freedom of speech, press, or religion, publicly expressed dissatisfaction with the government or religious authorities, or public opinion on social issues. The questions that the model sheds light on are, "Under what conditions do small shocks lead to a massive increase in protest by citizens?" and "How is the severity of protest affected by the centralization of authority?"

The period has three stages. In the first stage, the central authority chooses an action $a^C \in [0, 1]$. In the second stage, the non-central authority chooses an action $a^N \in [0, 1]$. The third stage has numerous substages. First, citizens choose whether to publicly accept ($a_j = 0$) or reject ($a_j = 1$) C's action. Then, a shock is realized where fraction $\beta \in (0, 1)$ of those choosing to accept in the first stage are encouraged to publicly reject for one subperiod. The shock can be interpreted as an event which momentarily reduces the perceived costs or increases the benefits of publicly rejecting C (such as neighboring polities erupting in protest). Meanwhile, all other citizens again choose to accept or reject C. More substages follow, with citizens choosing to accept or reject C in each substage until an equilibrium is reached and the game is over.[12] This specification is chosen to highlight the idea that social connectivity can lead to rapid equilibrium change; for example, protests in Egypt during the Arab Spring grew exponentially as more and more citizens revealed their previously hidden preferences.

Each citizen j derives utility from choosing actions, $a_j \in \{0, 1\}$, where the citizen publicly accepts C's

[11] The inclusion of only two authorities allows for tractability. The intuition underlying the main results of the model holds in more realistic situations including numerous types of authorities.

[12] Formally, an equilibrium is reached when each citizen has no incentive to change actions between substages.

dictates if $a_j = 0$ and rejects them if $a_j = 1$. Citizens derive greater utility from rejecting C's dictates when their own intrinsic "bliss point", b_j, is further away from zero. Each citizen is randomly assigned a bliss point from a normal distribution with mean μ and variance σ^2.[13] The citizens' utilities are interdependent; that is, they derive more utility by choosing actions that others choose.[14] Citizens observe how many other citizens rejected C (chose $a_j = 1$) in the previous substage and expect the same number of citizens to reject C in the current substage. If the citizens choose to publicly reject the authorities' dictates, they also incur costs which are a function of the actions of the institutional authorities, a^C and a^N. These costs are increasing in the size of the violation (as in Romer [1984], Iannaccone [1988], Bernheim [1994], Kuran [1987, 1995a], Akerlof [1997], Kuran and Sandholm [2008], Rubin [2011]) and represent the costs (or punishments) associated with publicly breaking a religious dictate, breaking a law, violating a political norm, and the like, depending on the type of authority in question.

Citizen j's preferences are described in each period by the following utility function:

$$\begin{aligned} U_j \quad = \quad & I\{a_j = 0\}\left[-m_1\left(a_j - b_j\right)^2 + m_2\frac{1}{M-1}\sum_{i\neq j} I\{a_i = 0\}\right] + \\ & I\{a_j = 1\}\left[-m_1\left(a_j - b_j\right)^2 + m_2\frac{1}{M-1}\sum_{i\neq j} I\{a_i = 1\} - m_3\left(a_j - a^N\right) - m_4\left(a_j - a^C\right)\right] \end{aligned} \tag{1}$$

where m_1, m_2, m_3, and m_4 are weighting parameters greater than zero and $I\{\cdot\}$ is an indicator function.

The non-central authority, N, is not directly affected by the actions of the citizenry - citizens revolt against C, not N. Instead, N weighs the intrinsic benefits of its action against the costs that C can impose for choosing actions contrary to C's desires. N can therefore be thought of as a legitimizing agent of C (e.g., a religious authority legitimizing an autocrat or a legal authority legitimizing elected officials).

For simplicity, I assume that the actions of the citizenry do not enter N's utility function. While N's actions do affect the citizenry, and the citizens' actions indirectly affect N's utility (through their effect on

[13] Normality is not a necessary feature of the analysis. Any type of distribution with two inflection points with provide similar results. If there is a rightward skew in the distribution (which is to be expected, since there is a fatter tail of citizens in opposition to the central authority in most oppressive regimes), then the results hold over a larger portion of the parameter space than is considered in this paper.

[14] This interdependence captures the influence of social norms which may arise from the importance individuals place on social identity, social custom, reputation, status, or conformity. This specification assumes that individuals derive utility from conforming. Gintis (2003) suggests that "pro-social" behavior may be biologically determined, as humans improved their biological "fitness" by internalizing cultural norms. Also see Greif (2010) and Greif and Tadelis (2010).

C), this assumption is justified if we consider the cost imposed by C as the salient one affecting N's actions.[15] Instead, N derives utility from choosing actions close to its intrinsic bliss point, $b^N \in (0, \mu)$, and it faces a cost from choosing actions which differ from the central authority, C. The upper bound μ indicates that it has a stronger preference for no protests occurring than the average citizen. N's preferences can be described as follows:

$$U_t^N = -n_1 \left(b^N - a^N\right)^2 - \gamma \left(a^N - a^C\right)^2, \tag{2}$$

where n_1 is a weighting parameter greater than zero. $\gamma \geq 0$ is the primary exogenous parameter of concern in the model. It denotes the degree to which the non-central authority incurs a cost from diverging from the action of the central authority.[16] Although there are certainly endogenous elements to γ in reality - the degree to which one authority incurs costs from diverging from the other could be a function of the degree to which the citizens abide by its dictates - endogenizing this key variable unnecessarily complicates the model. This paper concentrates on massive equilibrium changes over a short period and how such changes arise rapidly. Broader institutional changes which endogenously effect the level of centralization may follow in the long run due to the interactions described in the model, but should not be affected in the short run by the rapid, massive change which is at the heart of this model.[17]

The centralization parameter enters N's utility as a scalar which affects the cost N incurs for choosing an action different from C. At $\gamma = 0$, there is no such cost, at $\gamma \to \infty$ there is an infinite cost (if $a^N \neq a^C$), and at $\gamma \in (0, \infty)$ there is a positive cost that is increasing in γ. While it is possible (in reality, but not in the model) that C may also face costs from not conforming to N, the assumption of unidirectional centralization of coercive power allows for tractability.[18] It follows from this setup that at $\gamma \to \infty$, the two authorities are ostensibly the same actor: power over numerous dimensions is centralized in one authority (C). At large γ, C has significant but not unlimited power over varying types of sanctions.

---

[15] This assumption is tantamount to having γ be large relative to m_3. Even when γ is small, the effect of N's actions on C are of less relevance, since the cost imposed by C is small.

[16] For more on the centralization of coercive power, see Greif (2005) and Karaman (2009).

[17] Moreover, Rubin (2011) shows in a similar model that under a basic set of circumstances, endogenizing the degree of centralization merely exacerbates the effects seen under an exogenous parameterization, as the feedback between players is more enhanced.

[18] In fact, the model can be interpreted as one of *relative* centralization, where γ is the cost incurred by N for not following C's actions relative to the reverse situation (where C incurs costs). All that is needed for the results to hold is for N to have a greater cost than C.

The central authority, C, derives utility from choosing actions close to its bliss point, $b^C \in \left(0, b^N\right)$. The upper bound b^N indicates that it has a stronger preference for no protests occurring than N. C wishes to minimize the average number of citizens who reject its dictates.[19] C's preferences can be described as follows:

$$U^C = -c_1 \left(a^C - b^C\right)^2 - \frac{1}{M}\sum_i I\left\{a_i = 1\right\} \tag{3}$$

where c_1 is a weighting parameter greater than zero.

2.2 Solving the Model

2.2.1 Equilibrium Actions: Citizens and N

The model is solved using backwards induction. Equilibrium actions are denoted with superscript * and the Nash equilibrium concept is employed.

I first solve for the equilibrium actions of the citizenry. A little algebra indicates that citizen j chooses to publicly accept C's dictates ($a_j = 0$) when:

$$b_j \leq \frac{1}{2m_1}\left[m_1 - m_2\left(1 - \frac{2}{M-1}\sum_{i\neq j} I\left\{a_i = 0\right\}\right) + m_3\left(1 - a^{N*}\right) + m_4\left(1 - a^{C*}\right)\right]. \tag{4}$$

In equilibrium, some citizen has the largest bliss point, denoted b^*, of all of the citizens choosing $a_j = 0$. If an interior solution exists and there are enough citizens so that the law of large numbers is realized, then (denoting $F\left(\cdot\right)$ as the normal cdf with mean μ and standard deviation σ^2):

$$b^* = \frac{m_2}{m_1}F\left(b^*\right) + \frac{1}{2m_1}\left[m_1 - m_2 + m_3\left(1 - a^{N*}\right) + m_4\left(1 - a^{C*}\right)\right]. \tag{5}$$

Next, solve for the optimal action of N. Its first-order condition provides the result:

$$a^{N*} = \frac{n_1 b^N + \gamma a^{C*}}{n_1 + \gamma}. \tag{6}$$

[19] This is an indirect utility specification. We could think of C's optimization problem as maximizing the probability of staying in power while also having some optimal policy (b^C). Minimizing the number of citizens choosing $a_j = 1$ is tantamount to maximizing the probability of staying in power.

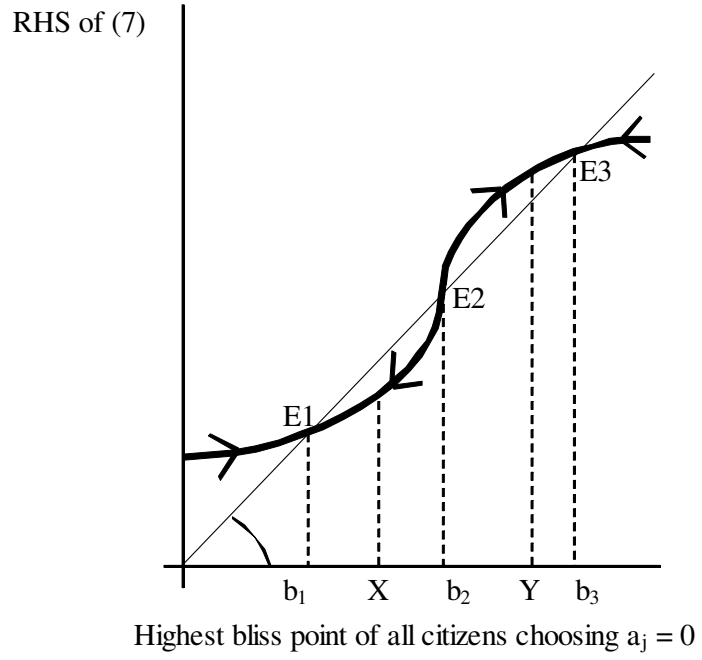
Plugging (6) into (5) entails that b^* is implicitly defined by:

$$b^* = \frac{m_2}{m_1} F\left(b^*\right) + \frac{1}{2m_1}\left[m_1 - m_2 + m_3 \frac{n_1\left(1-b^N\right)}{n_1+\gamma} + \left(m_3 \frac{\gamma}{n_1+\gamma} + m_4\right)\left(1-a^{C*}\right)\right]. \qquad (7)$$

2.2.2 Multiple Equilibria

Consider the equilibrium level of protest for a given level of a^{C*}. Equation (7) indicates the possibility that multiple equilibria exist. Indeed, since the distribution of bliss points is normally distributed, the right-hand side of (7) takes on the familiar S-shape seen in Figure 1. This figure (in a manner similar to Granovetter [1978] and Kuran [1995]) maps the highest bliss point of all citizens choosing $a_j = 0$ on the horizontal axis and the right-hand side of (7) on the vertical axis. When more citizens choose $a_j = 1$, there is a leftward movement along the curve. An equilibrium exists (solving (7)) where the curve crosses the 45-degree line.

Figure 1: Three Equilibria



The S-shaped curve in Figure 1 has many important features. The first is that it crosses the 45-degree line three times only if its slope is greater than one at middle of the curve (bliss point μ). It is straight-forward to see that the slope is greater than one at μ if the standard deviation (σ) is sufficiently small (meaning that citizens are more tightly bunched around μ). We will assume that σ is sufficiently small so that three equilibria exist for the rest of the analysis; it is precisely under this circumstance that preferences are most

interconnected (since most citizens are similar to each other), and this is the case that we are interested in.[20] Moreover, Figure 1 shows that 3 equilibria can exist: E1, E2, and E3. E3 is a "good" equilibrium from the central authority's perspective, since more citizens choose $a_j = 0$, while E1 is a "bad" equilibrium. For the rest of the analysis, assume that the pre-shock equilibrium is E3. After all, we are interested in situations where massive anti-authority movements emerge on what were quiet streets. We can interpret E3 as the "quiet streets" equilibrium, since most of the population publicly accepts C's dictates despite privately disagreeing with C. In sum, assume the following:

Assumption 1: There are three possible equilibria prior to the shock for any value of $a^C \in \left[0, b^C\right]$.

Assumption 2: Prior to the shock, the equilibrium that emerges is the one with the most citizens choosing $a_j = 0$ (Equilibrium E3 in Figure 1).

E1 and E3 are stable (or, in game theoretic terms, trembling hand perfect), while E2 is not. To see this, note that any point at which the curve is above the 45-degree line, such as bliss point Y in Figure 1, is one in which LHS<RHS of (7). Inequality (4) indicates that for citizens with bliss point between Y and b_3, the optimal action is $a_j = 0$. Hence, the citizen with bliss point Y cannot have the largest bliss point of all citizens choosing $a_j = 0$ in equilibrium; if it chooses $a_j = 0$, citizens with bliss points between Y and b_3 also have incentive to choose $a_j = 0$. This means that at equilibrium E3, if a small amount of citizens deviate (say, after the shock) and choose $a_j = 1$, the equilibrium will converge back to E3. Conversely, this means that at equilibrium E2, if even *one* citizen deviates and chooses $a_j = 0$, the equilibrium will move to E3. Likewise, at any point in which the curve is below the 45-degree line, such as bliss point X, LHS>RHS of (7). Inequality (4) indicates that at any bliss point between b_1 and X, the optimal action is $a_j = 1$. A similar logic to that espoused above indicates that if some citizens deviate from E1 to choose $a_j = 0$, the equilibrium will converge back to E1. Conversely, this means that at equilibrium E2, if even *one* citizen deviates and chooses $a_j = 1$, the equilibrium will move to E1.

This logic entails that equilibria E1 and E3 are stable - if a small group of citizens change their actions (after the shock), the old equilibrium quickly re-emerges. On the other hand, it only takes one citizen deviating from E2 for a new equilibrium to emerge. But just how stable are these equilibria, and under what

[20]Moreover, three equilibria can only exist when μ is not too small or two large. If μ is too small, the S-shape arches upward prior to reaching the 45-degree line, and the two cross only once (at the top of the S). If μ is too large, the S-shape flattens out at its top prior to reaching the 45-degree line, and the two cross only once (at the bottom of the S). The formal conditions under which three equilibria exist are available upon request.

conditions will a cascade from E3 to E1 emerge? It can be seen in Figure 1 that at equilibrium E3, if all of the citizens (plus one) with bliss points between b_2 and b_3 change their actions from public acceptance ($a_j = 0$) to public rejection ($a_j = 1$) of the central authority, E1 will emerge as the equilibrium outcome. All of the citizens with bliss points between b_1 and b_2 join the cascade to the new equilibrium. In other words, b_2 is the *threshold* bliss point - if citizens below bliss point b_2 choose $a_j = 1$, E1 will emerge, while E3 will emerge if citizens above b_2 choose $a_j = 0$.

Within the context of the model, this means that the shock may not end up affecting equilibrium actions at all. If the pre-shock equilibrium is E3 and $\beta < F(b_3) - F(b_2)$, then not enough citizens publicly disapprove after the shock (choose $a_j = 1$) to move the equilibrium to E1. Instead, the equilibrium moves back to E3, and all those who were affected by the shock go back to publicly accepting C's dictates ($a_j = 1$). This could occur if some people take to the streets, but upon doing so realize that public support for their cause is not as great as they expected, and hence go back inside and publicly abide by C's dictates. On the other hand, when the shock is sufficiently large ($\beta > F(b_3) - F(b_2)$), the initial equilibrium unravels and the post-shock equilibrium is E1. In this case, enough people take to the streets after the shock that more people are encouraged to do so (since preferences are interconnected), which encourages more to do so, and so on until $1 - F(b_1)$ citizens publicly reject C.

2.2.3 Cascades and Centralization

In the model, there are two ways in which an economy can move from E3 to E1 after a shock. First, if nearly all citizens are affected by the shock (β is large), then most citizens publicly protest and eventually E1 arises. This is a trivial result - it merely indicates that a large shock which encourages nearly everyone to change actions will change the equilibrium outcome. The second manner in which an economy moves from E3 to E1 is less obvious. This occurs when cascades of public dissent encourage individuals to reveal their preferences after seeing others do so. Cascades can arise when a small portion of the population is affected by the shock because the interconnectedness of preferences spreads the shock to much of the population. I focus on these outcomes for the rest of the paper; that is, I focus on cases of preference *revelation* rather than preference *change*. After all, it is under these conditions that seemingly quiet streets can erupt in protest after relatively small events trigger the spread of dissent.

To this end, I define a cascade as occurring when more people who are *not* directly affected by the shock switch actions (from public acceptance to rejection) than those who are directly affected by the shock. Using

the nomenclature from Figure 1, I formally define a cascade as follows:

Definition 1 *A **cascade** occurs if:*

i) $F(b_3) - F(b_2) < \beta$*: More than the threshold number of citizens change their actions after the shock, entailing that the equilibrium changes from E3 to E1.*

ii) $F(b_3) - F(b_2) < F(b_2) - F(b_1)$*: the shock can directly affect less than half of the citizens but still precipitate an equilibrium change from E3 to E1.*

The main purpose of the model is to highlight the relationship between centralization and cascades. To this end, note from (7) that changes in the centralization parameter (γ) or the central authority's action (a^{C*}) merely shift the curve in Figure 1. The curve shifts down as a^{C*} increases and shifts up as γ increases (since $a^{C*} < b^N$).[21] Hence, the first question that the model can answer is "under which conditions (with respect to γ) does a 'good' equilibrium (E3) emerge after the shock?"

Consider the following intuition. In high-γ economies, citizens falsify their preferences to a greater extent. Hence, fewer citizens publicly reject C (choose $a_j = 1$) since preferences are interconnected. This entails that the bliss point of the "threshold citizen" (b_2 in Figure 1) is further away from b_3 as γ increases, and a greater shock is necessary to pass the threshold. Therefore, the range of shock size (β) over which the economy stays at the pre-shock equilibrium (E3) after the shock is weakly increasing in centralization (γ), as noted in Proposition 1.

Proposition 1 *The parameter space over which the pre-shock equilibrium (E3) also emerges after the shock is weakly increasing in* γ*, ceteris paribus.*

This result indicates that highly centralized economies are more insulated against public rejection of the central authority. However, in the event that a shock does trigger a cascade, it is worth asking: how *severe* will the change in actions be after the shock? The following definition is useful in formalizing this analysis:

Definition 2 *The **cascade magnitude** is the number of citizens who change actions from publicly accepting* C *prior to the shock to publicly rejecting* C *after the shock.*

[21] Since it is assumed that there are 3 equilibria for all values of a^{C*}, the analysis does not focus on C's decision. C simply chooses some a^{C*} to balance the marginal deviation from its bliss point with the marginal increase in citizens choosing $a_j = 0$. C's choice is monotonic in γ, so we do not need to explictly solve for it to attain comparative statics.

I focus on the cases where cascades (as defined above) can occur. I ignore cases where movements from E3 to E1 only occur when shocks affect most of the population. This is not very interesting economically - it is a trivial result that big changes happen after big shocks.

Cascades can only arise when most citizens "disagree" with C.[22] I focus on this case ($\mu > \mu^*$ for some μ^* defined in the proof of Proposition 2), which often arises in autocratic regimes when the interests of the autocrat and the citizens are not aligned. Indeed, it is in these situations where revolutions occur; when a cascade occurs in a regime where the citizens disagree with the central authority, the change in expressed preferences is much greater than in a regime where most citizens agree with the central authority (as is suggested in Proposition 2).

It was noted in Proposition 1 that centralized authorities are better able to suppress dissent and are thus more insulated from small shocks. Since centralized authorities can impose multiple sanctions on dissent, citizens are less likely to publicly reject C *despite* disagreeing with its dictate. This enables a situation where citizens "falsify their preferences" to a greater degree in centralized regimes. That is, citizens under centralized rule are more likely to disagree with C but not publicly reject C. Kuran (1995a, p. 3) defines preference falsification as "the act of misrepresenting one's genuine wants under perceived social pressures." When citizens falsify their preferences, they choose actions which differ from their bliss point for two reasons. First, perceived social pressures encourage them to choose actions similar to those chosen by others. Secondly, this outcome is exacerbated when institutional sanctions are severe (m_3 and m_4 are large) and the actions of the authorities diverge from the bliss point of the citizenry.

The major upshot of increased preference falsification is that if a sufficiently large shock does occur (i.e., one that is large enough that at least the threshold citizen changes actions), the cascade magnitude is larger the more centralized the regime is. After a larger shock, larger cascades are more likely to occur where citizens are falsifying their preferences to a greater extent; once some citizens act closer to their internal preferences by publicly rejecting C (choosing $a_j = 1$), others will find it more attractive to publicly reject C, *especially* since they disagreed with C in the first place. Since there are more citizens who privately disagree with

[22] On the other hand, when μ is sufficiently small, there are two possible outcomes. The first is that citizens agree with C to such an extent that only the "good" equilibrium (E3) emerges, and few citizens publicly dissent. The second outcome is that multiple equilibria exist, but the difference between $F(b_3)$ and $F(b_2)$ is greater than the difference between $F(b_2)$ and $F(b_1)$. This is the relatively uninteresting case noted above where an equilibrium change from E3 to E1 can happen, but only when most of the people who change actions are directly affected by the shock.

C in centralized regimes, this information revelation mechanism is stronger. This logic is summarized in Proposition 2.

Proposition 2 *If a cascade arises, the cascade magnitude is weakly increasing in γ, ceteris paribus.*

When the citizens' bliss points are far away from the actions of C (μ is large, as it is in this case), larger cascades occur under highly centralized rule following shocks. Although highly centralized authorities are more insulated from small shocks, citizens are relatively unhappy. This means that when a shock is large enough that some citizens publicly reject C, the cost to publicly rejecting C decreases, encouraging more citizens to publicly reject C, and so on. Relative to the pre-shock state - which may often seem tranquil - centralized regimes are subject to massive changes in public opinion despite having the appearance of public acceptance.

2.3 Discussion

The intuition formalized in Proposition 2 offers two explanations for why *seemingly* tranquil, centralized societies can quickly undergo massive changes, especially when the centralized authority promotes policies that are detrimental to most citizens (μ differs substantially from a^C). One explanation, which is also offered by Granovetter (1978) and Kuran (1989, 1995a, 1995b), is that preference falsification can encourage latent movements in social norms to emerge after a shock. That is, an economic, political, or social shock may move equilibrium actions by enough to encourage most citizens, even those who are not directly affected by the shock, to choose drastically different actions.

The other explanation, which is novel to this paper, sheds light on the role that institutional structures play in determining the effects of shocks. It suggests that a high degree of centralization of coercive power discourages marginal changes to equilibrium actions after small shocks. Citizens have less incentive to publicly dissent, as they incur two institutional costs from doing so. The same citizens may be more encouraged to publicly dissent in less centralized societies, however, as they face less cost from doing so and the authorities (especially the non-central authority) react by changing their actions to a greater extent. This is why, as Proposition 1 notes, equilibria where there is little public dissent are more likely to emerge in highly centralized economies following a shock. Yet, when larger shocks materialize, large cascades towards vastly different equilibria are more likely to result in highly centralized economies. This occurs because citizens falsify their preferences to a greater extent in such economies, and thus large shocks encourage some citizens

to change their actions, in turn making it more likely that the institutional laws will be much different in the post-shock equilibrium.

Kuran (1995a, 1995b) and Yin (1998) do suggest that unanticipated regime change is more likely to occur in politically repressive countries. Their hypotheses coincide with the one made in the present paper, though it is not clear that their hypotheses hold when other types of freedoms (religious, economic, legal) exist in politically repressive regimes. The essential difference between the present hypothesis and Kuran's and Yin's is that I stress the interdependence of institutions that are able to impose different types of sanctions. This leads to a similar conclusion as Kuran and Yin, as such institutional structures are often found in politically repressive regimes.

The model also sheds light on the connection between institutional centralization and revolutions. Numerous definitions for revolution exist in scholarly works.[23] For example, Goldstone (2001) defines revolution as "an effort to transform the political institutions and the justifications for political authority in a society, accompanied by formal or informal mass mobilization and non-institutionalized actions that undermine existing authorities." Kuran (1989, 1995a) broadly defines a revolution as a discontinuous change in public opinion or social order and Davies (1962) defines revolutions as "violent civil disturbances that cause the displacement of one ruling group by another that has a broader popular basis for support."

The model suggests that revolutions (i.e., large movements from E3 to E1) may occur in centralized regimes after a shock *only* when the shock is sufficiently large; on the other hand, smaller shocks are more easily repressed in centralized regimes. "Shock" is a somewhat ambiguous term, but the literature on revolutions provides numerous types of shocks that could precipitate revolutions, such as sharp reversals in economic fortunes (Davies 1962; Tanter and Midlarsky 1967), rapid economic growth (Olson 1963), defeat in war, or sustained population growth (Goldstone 2001).

In sum, the following testable predictions arise from this framework:

- Equilibria where little public dissent exists are more likely to arise in highly centralized economies.
- If a shock is large enough to cause a cascade, the change in pre- and post-shock actions is greater in more highly centralized economies.

[23]There is a large literature merely attempting to define the term revolution. I have no desire to enter this debate, summarized nicely by Goldstone (2001), and instead note that revolutions are an extreme form of massive equilibrium change.

3 Austerity Riots and Centralization

A primary implication of the model is that countries with centralized authorities are more insulated from change when shocks are small but are more susceptible to sudden, massive changes when shocks are large. In this section, I test the hypothesis by analyzing the severity of austerity protests in the developing world between 1976 and 1992. Such protests were common in the developing world beginning in the mid-1970s in reaction to measures employed - almost always as a condition of IMF aid - to combat inflation and government debt.[24] I test the relationship between a series of "IMF pressure" variables and severity of protests over differing degrees of institutional centralization to shed light on the relationships espoused in the model. Although the data cannot speak to the microeconomic mechanisms highlighted in the model (namely, those related to internal and expressed preferences and cascades), it can shed light on the connections between macroeconomic events, institutional structures, and changes in publicly expressed opinions. This analysis underscores the determinants of protest severity (a macro concept) *as well as* sudden equilibrium changes (a micro concept), since the latter is realized in the former.

Modern austerity protests began in the mid-1970s, with the first one occurring in Peru in 1976. The protests were sparked by austerity measures which were almost always imposed by the IMF as a condition of assistance. The stated aims of these measures were freeing up markets and cutting government spending in order to reduce government debt and curb massive inflation. These market-based measures, known by some as "shock treatment", included currency devaluation, broad reduction of spending on the public sector, privatization of state-owned corporations, cuts in public subsidies for food and basic necessities, wage restraints, higher interest rates, and elimination of protectionism (Walton and Seddon 1994).[25]

These policies sparked protests in many places where they were imposed. Such protests were defined by Walton and Seddon (1994) as "large scale collective actions including political demonstrations, general strikes, and riots, which are animated by grievances over state policies of economic liberalization implemented in response to the debt crisis and market reforms urged by international agencies." The international agency most associated with these protests is the IMF, and hence Joseph Stiglitz called them "IMF riots".

The distributional implications of these policies are clear – most policies negatively affected the urban poor, at least in the short run (Walton and Ragin 1990; Walton and Seddon 1994). The protests were primarily

[24]The evolution of IMF conditionality, as well as arguments for and against conditionality, are summarized in Dreher (2004, 2009).

[25]For a scathing review of these policies in the developing world over the last half-century, see Klein (2007).

urban in nature, often following a rise in a price for a specific good or an elimination of a subsidy. In some cases, the protests were relegated to one city and remained non-violent, such as organized strikes planned in Ecuador and Bolivia (Walton and Ragin 1990). On the other extreme, protests turned into deadly riots which spread throughout the country, as was the case of the Venezuelan protest of 1989, where a week of rioting spread from Caracas to 16 other cities.

What determined the differences in severity of these protests? This topic has received some attention from sociologists and political scientists, who have proposed a wide range of explanations. Walton and Seddon (1994) and Walton and Ragin (1990) provide evidence that over-urbanization plays a key role in both the presence and severity of the riots. They suggest that the linkage between the two lies in the development of organizational infrastructure capable of mobilizing political action. Walton and Ragin (1990) also suggest that IMF pressure significantly affects protest severity but inflation and debt do not.[26]

In this section, I analyze how changes in IMF involvement affected the likelihood of severe protest in a country. When IMF pressure is present, pressures to liberalize markets generally ensue - and protests may follow. Propositions 1 and 2 of the model suggests that since austerity measures differ substantially from the bliss point of most citizens (μ is much different that a^C), when IMF pressure (the "shock" in the model) is small, centralized economies will better be able to suppress protests. However, significant IMF pressure is more likely to precipitate massive changes in centralized economies. In other words, the following prediction arises from the model:

Prediction 1: When there is a small amount of IMF pressure, austerity protests will on average be less severe in countries with more centralized institutions, all else being equal. However, when there is a large amount of IMF pressure, austerity protests will on average be more severe in countries with more centralized institutions.

3.1 Data

Data were gathered on austerity protests covering the same years as Walton and Seddon (1994): 1976-1992. The former date denotes the onset of the first modern austerity protest while the latter represents the time in which Walton and Seddon went to press.

[26] On the other hand, Auvinen (1997) finds that poor economic performance (indicated by high inflation and large debt service) is associated with political demonstrations, riots, and strikes.

As noted by Walton and Ragin (1990), obtaining a complete list of debtor countries that experienced international pressure to implement austerity measures can only be done indirectly, as the exact terms negotiated between the IMF and debtor countries is kept secret. To this end, I employ three measures identified by Walton and Ragin as indicative of IMF pressure: 1) the country employed the "extended fund facility" (EFF), generally reserved for countries suffering a significant imbalance of payments relating to structural maladjustments in production and trade (IMF [various]), in a given year between 1976 and 1992;[27] 2) the country's ratio of IMF funds used to its IMF quota exceeded 125% in a given year between 1976 and 1992; 3) the country rescheduled or renegotiated its debt in a given year between 1976 and 1992.[28] 70 countries satisfied one of these three criteria between 1976 and 1992.[29] I form a panel that is restricted to years in which one of these criteria were satisfied in the country in question within one year (either before or after). A list of these countries and the years employed in the data is available in Appendix Table A1.

40 countries in the data experienced austerity protests between 1976 and 1992. A Lexis-Nexis search of news reports of the 70 countries listed in Table A1 (as well as any listed in Walton and Seddon [1994] that were not in Table A1) from 1976-1992 produced 116 separate instances of austerity protest. Protests and riots were *only* documented if they resulted from austerity measures or IMF pressure - other types of anti-government protests or strikes are not included in the data. Planned general strikes and small, non-violent, sector-specific strikes are also not included in the data (even if they resulted from austerity measures).[30]

---

[27]The IMF defines the extended fund facility as "an IMF lending facility established in 1974 to assist member countries in overcoming balance of payments problems that stem largely from structural problems and require a longer period of adjustment than is possible under a Stand-By Arrangement. A member requesting an Extended Arrangement outlines its objectives and policies for the whole period of the arrangement (typically three years) and presents a detailed statement each year of the policies and measures it plans to pursue over the next 12 months." (IMF)

[28]Walton and Ragin split the last category into two: debt rescheduling and debt renegotiation. My reading of the data suggests that the line between these two is often blurred, so I have lumped them together. Data for EFF and IMF quota comes from various IMF Annual Reports; data for IMF funds used comes from the World Development Indicators database; data for debt rescheduling and restructuring comes from clubdeparis.org, Kuhn and Guzmàn (1990), and Dillon et al. (1985).

[29]Some countries were omitted from the dataset due to lack of IMF or control data. These include:Angola, Barbados, Burma, Dominica, Equatorial Guinea, Grenada, Liberia, Somalia, Uganda, Western Samoa, Yemen, and Yugoslavia. Iran and South Korea did not satisfy any of these conditions but are included in the data since there was an austerity protest in each country.

[30]All results are robust to inclusion of general strikes and industry-specific protests as severity 1 protests. These results are available in the Appendix. General strikes are not included in the base results because the model is intended to analyze changes in individual behavior (on a collective scale) resulting from shocks, not organized, institutionally-driven protests.

I subjectively coded each of these protests by severity using the following criterion, which are discussed further in Appendix B. An instance was scored 1 if it were a small (relative to population), confined (to one or two cities) protest. An instance was scored 2 if it were either prolonged but confined or widespread but not prolonged and 3 if the protest were prolonged and contained widespread riots. Only protests with both of these characteristics were coded level 3. An example of a protest coded 3 occurred in Algeria in October 1988, when 159 protesters were killed in a few major Algerian cities over the span of week and thousands were injured and arrested. The government's response to the protests, including those which lead to deaths, were *not* taken to account when creating the severity measures. Where government action occurred, the index takes into account the reported events that the government was responding to, not the government response itself. The reason for this is that it is possible that centralized governments are more likely to respond with violence. Hence, including the government's response would bias the severity index in favor of the proposed hypothesis.

While coding these protests is an admittedly subjective process, a reading of the articles reporting on the protests showed that most protests/riots easily fit into one of these three categories. The differences between protests coded 1 and other protests are especially stark. The difference between protests coded 2 and 3 are less obvious and thus more subjective, but this is not an issue in the analysis, since protests of these two severity levels are always lumped together. I also create an alternative index, found in Appendix B, for protests in which the severity level was not obvious. Table 1 shows the protests data broken down by continent.[31]

Table 1: Protests and Severity by Continent

Region	Protests Indexed 1	Protests Indexed 2	Protests Indexed 3	Total Protests
Africa	9	9	3	21
Asia	10	0	1	11
Central America	16	8	1	25
Europe	7	0	2	9
Middle East	2	2	5	9
South America	17	23	1	41
Total	**61**	**42**	**13**	**116**

The intuition outlined in the model indicates that a good proxy for institutional centralization is one that accounts for one authority's ability to affect numerous types of sanctions. One such variable is spelled out in

[31]Table A1 shows the protest data broken down by year and Table A3 shows the data broken down by country.

the Polity IV data set (Marshall and Jaggers 2008): constraint on the executive. This variable is defined as:

> The extent of institutionalized constraints on the decision-making powers of chief executives, whether individuals or collectivities. Such limitations may be imposed by any "accountability groups." In Western democracies these are usually legislatures. Other kinds of accountability groups are the ruling party in a one-party state; councils of nobles or powerful advisors in monarchies; the military in coup-prone polities; and in many states a strong, independent judiciary.

This variable ranges from 1 to 7, with 1 equaling "Unlimited Authority" (no regular limitations on the executive's actions) and 7 equaling "Executive Parity or Subordination" (accountability groups have effective authority equal to or greater than the executive in most areas of activity). This variable provides an ideal proxy for the degree of institutional centralization, as spelled out in the model, because it measures the degree to which political authorities can extend multifarious sanctions.

A weaker proxy of centralization is the Freedom House (2009) "degree of political freedom" variable. This variable ranges from 1 to 7, with 1 equaling "most free" and 7 equaling "least free". This is hardly an ideal measure of centralization, as defined in the model, since it does not directly underscore the ability of the central authority to impose numerous sanctions. However, centralized authorities generally also have the ability to restrict political freedoms. Nowhere do I claim that centralization *has* to be the driving force behind political freedom; I merely suggest that this is one way in which centralization manifests itself. For these reasons, regressions using this variable should be regarded as robustness checks relative to the results employing constraint on the executive data.

Other controls are employed to account for phenomena which political scientists, economists, and sociologists consider as salient factors associated with protest activity. These include the urbanization rate, per capita GDP, population, and a measure of religious fractionalization.[32] The religious fractionalization index is constructed like a Herfindahl index, equaling the sum of the proportion of each religion in the country squared. The summary statistics of all controls are reported in Appendix Table A4.

---

[32]Data on urbanization, GDP, and population comes from World Bank (various). The measure of religious fractionalization is derived from data found in Barrett, Kurian, and Johnson (2001). The controls employed in these regressions are consistent with those pointed out by Auvinen (1997) as ones that traditionally have received attention in the political science, economics, and sociology literature related to political conflict. Inflation and government debt are not included as controls because they frequently *lead to* IMF involvement.

3.2.1 Testing for the Presence of Protest

The data provide a chance to test the model's primary prediction: countries with centralized political authorities should have smaller changes (relative to countries with decentralized authorities) in expressed public opinion (as seen in protests) when shocks are small, but larger changes when shocks are large. Yet, before we can test how shocks (proxied with IMF variables) affect the severity of protests, we must establish *whether* the proxies are good predictors of protest. In particular, the model suggests testing the following equation, where Protest_{it} is a dummy equaling 1 if there is a protest in country i in year t, X is the set of control variables, and "CP" denotes the "centralization proxy", where both the "constraint on the executive" and "political freedom" variables are transformed so that higher values indicate greater centralization.

$$\text{Protest}_{it} = \delta_0 + \delta_1 \text{Shock}_{it} + \delta_2 \text{CP}_{it} + \delta X_{it} + \varepsilon_{it} \tag{8}$$

There are 3 different IMF variables that proxy for a shock: use of IMF funds, use of EFF funds, and the number of restructurings and reschedulings. The first two variables are deflated by the country's IMF quota, which is based on its standing in the world's economy. Walton and Ragin (1990) note that all three of these variables are good predictors of austerity protests, with the number of restructurings being the strongest predictor.[33] I also create variables for the greatest single-year level of the three IMF proxies over the previous two years. These latter variables may be more suitable, since the chain of events from IMF pressure to implementation of austerity programs to protests can take months to matriculate and are thus often realized over multiple years.

Regression equation (8) does not provide a test of the model's hypothesis; instead, it provides a test of how well the IMF variables proxy for a "shock" *in the context* of the model. The model indicates that the coefficient on the IMF "shock" variable, δ_1, should be positive (and statistically significant). If it is not, then the variable in question is not a predictor of protests in general and thus should shed little light on how

[33] Walton and Ragin formulate an "IMF pressure index" which is the summation of the z-scores of all 4 IMF indicators. I do not do this for two reasons: 1) I find, like Walton and Ragin, that the number of restructurings and reschedulings is by far the best predictor; 2) the sum of the z-scores is dominated by the restructuring variable, which is not normally distributed, and hence converting it to a z-score is erroneous. I have analyzed the regressions reported in this paper using Walton and Ragin's z-score variable and the results are similar - though not as strong - as the ones reported here. These results are available upon request.

institutional centralization affects the *severity* of protests.

A probit model is used to test equation (8). The probit coefficients are reported in Table 2.[34] All regressions include continent dummies, and standard errors are clustered by continent.[35] The results indicate that the "use of IMF funds" and "EFF" variables are not good predictors of protests, but the "restructuring/rescheduling" variable is a good predictor. The coefficients on the IMF Pressure Index are statistically insignificant in all of the regressions where "use of IMF funds" and "EFF" variables are employed as the shock proxy and all other controls are included. However, the number of restructurings or reschedulings appears to be a strong predictor of protests (the coefficient is always positive and statistically significant), a result also found in Walton and Ragin (1990). Hence, for the remainder of the analysis I will only employ reschedulings - not use of IMF funds or EFF - as a proxy for an IMF "shock".

3.2.2 Relating Centralization and Protest Severity

Since the rescheduling variable is a good predictor of protests, we can re-write Prediction 1 as the following:

Prediction 1A: All else being equal, a change to a more centralized economy should have a positive (negative) effect on the probability of a more severe protest occurring when the restructuring variable is large (small)

As in the model, Prediction 1A suggests that there is a non-linear relationship between centralization and the severity of protests. This relationship can be estimated with the regression model in equation (9). The dependent variable, Protest Severity$_{it}$, equals one if the most severe protest in country i and year t equals 2 or 3 and equals zero otherwise. Unfortunately, there are too few observations of protests of severity 3 to test the model using a dependent variable which equals one only if the protest is of severity 3.[36] This should not detract from the results, however, as the most significant differences in protest severity are between those coded 1, which are generally confined and short, and 2 and 3, which are more widespread and long in duration. As before, "CP" denotes the centralization proxy (either the constraint on the executive or political

[34]Table A5 reports regressions where the IMF variables are taken over two years. Results are very similar to Table 2.

[35]Including country dummies would be ideal, but there is too little variation within countries over time for this to be a feasible approach, as all results are dependent on a small number of observations. Using non-clustered standard errors gives largely similar results, which are available upon request.

[36]Nevertheless, the results are broadly robust (in terms of statistical significance) to an ordered probit specification.

Table 2: Protest Presence (Probit Coefficients)

	Dependent Variable: Protest Presence (0/1)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Use of Funds/Quota (if > 1.25)	-0.000	0.018	0.021						
	(0.089)	(0.092)	(0.091)						
Extended Fund Facility/Quota				0.075***	0.037	0.033			
				(0.027)	(0.036)	(0.037)			
# of reschedulings/restructurings							0.389***	0.304***	0.303***
							(0.099)	(0.108)	(0.110)
Constraint on Executive		-0.020			-0.020			-0.022	
		(0.023)			(0.023)			(0.024)	
Political Rights			-0.041**			-0.037			-0.041
			(0.018)			(0.024)			(0.025)
Urbanization Rate		0.913	0.877		0.870	0.838		0.698	0.656
		(1.153)	(1.134)		(1.154)	(1.138)		(1.025)	(1.000)
Log of Real GDP		-0.188	-0.193		-0.180	-0.184		-0.180	-0.183
		(0.128)	(0.141)		(0.122)	(0.137)		(0.111)	(0.126)
Religious Fractionalization		0.656	0.630		0.648	0.622		0.600	0.568
		(0.640)	(0.644)		(0.670)	(0.672)		(0.645)	(0.654)
Log of Population		0.195**	0.193**		0.190**	0.188**		0.188**	0.185**
		(0.087)	(0.085)		(0.084)	(0.082)		(0.086)	(0.084)
Number of Previous Protests		0.038**	0.039**		0.039**	0.040**		0.044**	0.046***
		(0.018)	(0.017)		(0.018)	(0.016)		(0.018)	(0.017)
Continent Dummies	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	805	801	801	807	803	803	807	803	803
pseudo R-squared	0.000	0.108	0.109	0.006	0.109	0.110	0.026	0.122	0.123

Standard errors, clustered by region, in brackets; *** p<0.01, ** p<0.05, * p<0.1; A constant term included in each regression

rights variable), while the shock variable is the number of reschedulings (over one or two years).[37]

$$\text{Protest Severity}_{it} = \eta_0 + \eta_1 \text{Shock}_{it} + \eta_2 \text{CP}_{it} + \eta_3 \text{Shock}_{it} * \text{CP}_{it} + \eta X_{it} + \varepsilon_{it} \quad (9)$$

Prediction 1A implies that η_2 should be negative and η_3 should be positive. In other words, protest severity

[37]There is the possibility that the regressions specified above suffer from an endogeneity problem. That is, it is possible that more centralized regimes are more (or less) able to access IMF funds and impose austerity. If this is true, the "shock" variable (rescheduling) is a function of the centralization proxy, and the regression model is misspecified. Moreover, Kohlscheen (2010) and van Rijckeghem and Weder (2009) find a negative relationship between constraints on the executive power (the centralization proxy) and sovereign debt default (which is related to IMF conditionality). However, the correlations between the shock variables and the centralization proxies are almost 0. Amongst the observations used in the regressions, $\sigma_{RESC,CE} = -0.0186, \sigma_{RESC,PR} = -0.0741$, where $RESC$ is the rescheduling variable, CE is the "Constraint on the Executive" variable, and PR is the "Political Rights" variable. Moreover, regressions with the rescheduling variables as the dependent variables and the centralization proxies and other controls on the right-hand side provides highly insignificant results on the centralization proxy coefficients. These results are available upon request.

should be decreasing in centralization when shocks are small (and hence the interaction term is small), while protest severity should be increasing in centralization when shocks are large. These predictions are mostly confirmed in Table 3, which reports the probit coefficients of an estimation of equation (9).

The coefficient on the centralization proxies (η_2) is negative in columns (2)-(4), though it is never statistically significant, while the coefficient on the interaction term is positive in all regressions and is statistically significant in columns (2)-(4). A much more instructive look is provided by Tables 4 and 5, which map the probability of a severe protest occurring over varying amounts of reschedulings and values of the centralization parameter. Again, the constraint on the executive has been transformed so that a value of 7 is the most centralized (least constraint) and the value of 1 is the least centralized (most constraint). These probabilities were derived using the coefficients in Table 3, taken at the average of the control variables.[38]

A number of patterns emerge from these tables. First, in the lower panel of Table 4 and in both panels of Table 5, severe protests are less likely to occur as centralization increases when there are zero reschedulings. Although the last column suggests that this trend is not statistically significant, this is in line with what the model predicts: centralized regimes are more able to suppress dissent when shocks are weak or non-existent. It is not surprising that this result is not statistically significant - if there is no evidence of a shock, we would not expect a severe protest to occur in *any* economy, centralized or not. These comparative statics reverse, however, when reschedulings occur. In all four panels of Tables 4 and 5, the probability of severe protest is increasing in centralization when a rescheduling occurs, with the trend being stronger when multiple reschedulings occur. This trend is statistically significant in 5 of the 8 specifications. This result is consistent with the model: although centralized regimes are good at suppressing small shocks, they are susceptible to massive changes when larger shocks occur. Indeed, the probability of a severe protest occurring in the most centralized regimes is more than double that of the least centralized regimes in 5 of the 8 specifications where at least one rescheduling occurs.

In sum, this empirical exercise is meant merely to support the theoretical contribution of the model. Although the analysis does not speak to the micro mechanisms suggested in the model, it does confirm its testable predictions. Most importantly, it provides evidence that centralized authorities are able to suppress changes in publicly-expressed opinion when shocks are small, but are susceptible to massive changes in publicly-expressed opinion when shocks are large.

---

[38]The Africa dummy is set equal to 1 and all other continent dummies set equal to 0. The results are robust to setting other continent dummies equal to 1.

Table 3: Presence of Severe Protest (Probit Coefficients)

	Dependent Variable: Dummy = 1 if Protest 2 or 3			
	(1)	(2)	(3)	(4)
# of reschedulings	0.099	0.007		
	(0.148)	(0.115)		
Constraint on Executive	0.032		-0.033	
	(0.035)		(0.041)	
# of reschedulings*Constraint on Executive	0.024			
	(0.050)			
Political Rights		-0.023		-0.056
		(0.053)		(0.052)
# of reschedulings*Political Rights		0.048*		
		(0.027)		
# of reschedulings (over 2 years)			-0.246	-0.093
			(0.152)	(0.076)
# of reschedulings (over 2 years)*Constraint on Executive			0.085**	
			(0.035)	
# of reschedulings (over 2 years)*Political Rights				0.061**
				(0.024)
Urbanization Rate	0.959	1.013	1.032	1.065
	(0.649)	(0.778)	(0.809)	(0.857)
Log of Real GDP	-0.294*	-0.323*	-0.312*	-0.341*
	(0.150)	(0.168)	(0.167)	(0.179)
Religious Fractionalization	0.740	0.754	0.760	0.741
	(0.587)	(0.581)	(0.543)	(0.523)
Log of Population	0.183	0.195	0.191	0.198
	(0.138)	(0.130)	(0.134)	(0.127)
Number of Previous Protests	0.029	0.017	0.017	0.014
	(0.032)	(0.032)	(0.036)	(0.032)
Continent Dummies	Yes	Yes	Yes	Yes
Observations	705	705	690	690
pseudo R-squared	0.124	0.122	0.123	0.118

Standard errors, clustered by region, in brackets; *** p<0.01, ** p<0.05, * p<0.1; A constant term included in each regression

Table 4: Probability of Large Protest, varying shock and centralization levels

Pr(Protest = 2 or 3)

	Constr on Exec = 1	Constr on Exec = 2	Constr on Exec = 3	Constr on Exec = 4	Constr on Exec = 5	Constr on Exec = 6	Constr on Exec = 7	p-value: H_o: Column 1 = Column 7
# of reschedulings = 0	0.023***	0.024***	0.026***	0.028***	0.030***	0.033***	0.035***	0.409
	[0.004]	[0.003]	[0.003]	[0.004]	[0.006]	[0.009]	[0.012]	
# of reschedulings = 1	0.030***	0.034***	0.039***	0.043***	0.049***	0.055***	0.061***	0.004
	[0.005]	[0.005]	[0.005]	[0.006]	[0.007]	[0.008]	[0.010]	
# of reschedulings = 2	0.040***	0.047***	0.055***	0.065***	0.076***	0.088**	0.101*	0.317
	[0.015]	[0.013]	[0.014]	[0.019]	[0.028]	[0.040]	[0.055]	
# of reschedulings = 0 (over 2 years)	0.040***	0.037***	0.035***	0.032***	0.030***	0.028***	0.026***	0.438
	[0.012]	[0.008]	[0.005]	[0.003]	[0.003]	[0.005]	[0.007]	
# of reschedulings = 1 (over 2 years)	0.028***	0.032***	0.035***	0.040***	0.044***	0.049***	0.055***	0.000
	[0.003]	[0.002]	[0.002]	[0.003]	[0.003]	[0.004]	[0.004]	
# of reschedulings = 2 (over 2 years)	0.019***	0.026***	0.036***	0.048***	0.064***	0.083***	0.106***	0.000
	[0.005]	[0.006]	[0.006]	[0.008]	[0.011]	[0.016]	[0.023]	

Standard errors, clustered by region, in brackets; *** p<0.01, ** p<0.05, * p<0.1

Estimates in the top 3 rows derived from Column 1 of Table 3 and estimates in the bottom 3 rows derived from Column 3 of Table 3

4 Conclusion

This paper analyzes the institutional roots of massive social, economic, and political changes. It employs a simple economic model which suggests that authorities in centralized economies are relatively insulated from small shocks but may be susceptible to cascades resulting in massive changes if shocks are larger. This result arises because citizens living under centralized authorities are more likely to choose actions that differ from their intrinsic optima, as they face numerous costs from publicly stating their true beliefs. This entails that small shocks are unlikely to upset the equilibrium outcome under centralized rule; individuals are unwilling to incur the numerous, sometimes heavy sanctions associated with transgressing the centralized authority's dictates. However, a large shock may encourage some citizens to incur these costs, which can trigger a cascade that results in a massive change in equilibria.

This hypothesis is tested using data from austerity protests in 1976-1992. A regression analysis supports the model's hypothesis, suggesting that increasing the number of debt restructurings or renegotiations undertaken by a country leads to more severe protests in economies with centralized political authorities. Meanwhile, such protests are less likely to occur (though not to a statistically significant degree) in economies with centralized political authorities when there are zero restructurings.

Table 5: Probability of Large Protest, varying shock and centralization levels

Pr(Protest = 2 or 3)

	Political Rights = 1	Political Rights = 2	Political Rights = 3	Political Rights = 4	Political Rights = 5	Political Rights = 6	Political Rights = 7	p-value: H_o: Column 1 = Column 7
# of reschedulings = 0	0.037**	0.035***	0.034***	0.032***	0.030***	0.029***	0.027***	0.679
	[0.017]	[0.012]	[0.009]	[0.006]	[0.005]	[0.007]	[0.009]	
# of reschedulings = 1	0.042***	0.044***	0.047***	0.049***	0.052***	0.055***	0.058***	0.367
	[0.015]	[0.013]	[0.011]	[0.009]	[0.008]	[0.007]	[0.008]	
# of reschedulings = 2	0.047**	0.055***	0.064***	0.073***	0.084***	0.096***	0.109***	0.025
	[0.019]	[0.021]	[0.023]	[0.026]	[0.030]	[0.034]	[0.040]	
# of reschedulings = 0 (over 2 years)	0.048**	0.042***	0.038***	0.033***	0.029***	0.026***	0.023***	0.327
	[0.020]	[0.013]	[0.008]	[0.005]	[0.004]	[0.006]	[0.008]	
# of reschedulings = 1 (over 2 years)	0.045***	0.045***	0.046***	0.046***	0.046***	0.047***	0.047***	0.887
	[0.015]	[0.012]	[0.009]	[0.006]	[0.004]	[0.004]	[0.006]	
# of reschedulings = 2 (over 2 years)	0.042***	0.048***	0.055***	0.062***	0.071***	0.080***	0.090***	0.021
	[0.012]	[0.012]	[0.012]	[0.012]	[0.014]	[0.016]	[0.020]	

Standard errors, clustered by region, in brackets; *** p<0.01, ** p<0.05, * p<0.1

Estimates in the top 3 rows derived from Column 2 of Table 3 and estimates in the bottom 3 rows derived from Column 4 of Table 3

The model applies to numerous historical and contemporary phenomena. The most recent example is the Arab Spring of 2011, where citizens who had quietly lived under oppressive, centralized regimes for decades revolted in massive numbers in Egypt, Tunisia, Libya, Syria, and Bahrain. Another example is the fall of communism in the Soviet Union, which was due in part to the multi-faceted sanctions imposed by the Communist Party, consistent with the logic spelled out in this model. Similarly, the centralization of authority in Tsarist Russia may have led to the incredible scale of the Bolshevik Revolution (while also explaining the central government's ability to suppress numerous smaller outbreaks in the nineteenth century). The interdependence between the Chinese bureaucracy and Qing rulers may help explain the scale of the Taiping Rebellion (1850-1864), which followed after massive deflation systemically affected much of the Chinese countryside. The model also has implications for the future of centralized regimes such as those in Iran, China, North Korea, and Zimbabwe.[39]

This paper is *not* meant to suggest that a general framework exists for predicting revolutions or massive social change.[40] The amount of variables necessary for a revolution to occur likely renders this an impossible

[39]Of course, the model also has implications for decentralized regimes, especially ones espousing separation between church and state. Such regimes are less likely to be subject to revolutions, as decentralized authorities have more incentive to respond to the citizenry.

[40]Nor is this paper meant to lay out any specific prediction concerning the future of centralized economies. Instead, it provides a general

task. This paper, does, however, suggest that one ubiquitous set of conditions - those associated with the centralization of coercive power - are conducive to massive changes in equilibrium outcomes.

References

Akerlof, George A. 1980. "A Theory of Social Custom, of Which Unemployment May be One Consequence." *Quarterly Journal of Economics* 94(4): 749-775.

———. 1997. "Social Distance and Social Decisions." *Econometrica* 65(5): 1005-1027.

Akerlof, George A., and Rachel E. Kranton. 2000. "Economics and Identity." *Quarterly Journal of Economics* 115(3): 715-753.

———. 2005. "Identity and the Economics of Organizations." *Journal of Economic Perspectives* 19(1): 9-32.

Alevy, Jonathan E., Michael S. Haigh, and John A. List. 2007. “Information Cascades: Evidence from a Field Experiment with Financial Market Professionals.” *Journal of Finance* 62(1): 151-180.

Anderson, Lisa R., and Charles A. Holt. 1997. "Information Cascades in the Laboratory." *American Economic Review* 87(5): 847-862.

Auvinen, Juha. 1997. “Political Conflict in Less Developed Countries, 1981-89.” *Journal of Peach Research* 34(2): 177-195.

Banerjee, Abhijit V. 1992. "A Simple Model of Herd Behavior." *Quarterly Journal of Economics* 107(3): 797-817.

———. 1993. "The Economics of Rumours." *Review of Economic Studies* 60(2): 309-327.

Barrett, D.B., G.T. Kurian, and T.M. Johnson 2001. *World Christian Encyclopedia*, 2nd ed. Oxford: Oxford University Press.

Bernheim, B. Douglas. 1994. "A Theory of Conformity." *Journal of Political Economy* 102(5): 841-877.

---

framework which links centralized institutions to revolutionary activity. Olsson-Yaouzis (2012) is a recent addition to the literature providing a framework which predicts revolutionary activity. He argues that revolutions should occur in regimes which lose their will to punish dissent early and severely.

Besley, Timothy and Stephen Coate. 2003. "Centralized versus decentralized provision of local public goods: a political economy approach." *Journal of Public Economics* 87: 2611-2637.

Besley, Timothy and Torsten Persson. 2011. "The Logic of Political Violence." *Quarterly Journal of Economics* 126(3): 1411-1445.

Bikhchandani, Sushil, David Hirshleifer, and Ivo Welch. 1992. "A Theory of Fads, Fashion, Custom, and Cultural Change as Information Cascades." *Journal of Political Economy* 100(5): 992-1026.

————. 1998. "Learning from the Behavior of Others: Conformity, Fads, and Informational Cascades." *Journal of Economic Perspectives* 12(3): 151-170.

Bueno de Mesquita, Bruce. 2009. *The Predictioneer's Game: Using the Logic of Brazen Self-Interest to See & Shape the Future*. New York: Random House.

Callander, Steven. 2007. "Bandwagons and Momentum in Sequential Voting." *Review of Economic Studies* 74(3): 653-684.

Çelen, Boğaçhan, and Shachar Kariv. 2004. "Distinguishing Informational Cascades from Herd Behavior in the Laboratory." *American Economic Review* 94(3): 484-498.

Davies, James C. 1962. "Toward a Theory of Revolution." *American Sociological Review* 27(1): 5-19.

Dillon, K. Burke, C. Maxwell Watson, G. Russell Kincaid, and Chanpen Puckahtikom. 1985. *Recent Developments in External Debt Restructuring*. Washington: IMF.

Dreher, Axel. 2004. "A public choice perspective of IMF and World Bank lending and conditionality." *Public Choice* 119: 445-464.

————. 2009. "IMF Conditionality: theory and evidence." *Public Choice* 141: 233-267.

Ellis, Christopher J. and John Fender. 2011. "Information Cascades and Revolutionary Regime Transitions." *Economic Journal* 121(553): 763-792.

Faguet, Jean-Paul. 2004. "Does decentralization increase government responsiveness to local needs?: Evidence from Bolivia." *Journal of Public Economics* 88(3-4): 867-893.

Fershtman, Chaim, Kevin M. Murphy, and Yoram Weiss. 1996. "Social Status, Education, and Growth." *Journal of Political Economy* 104(1): 108-132.

Fershtman, Chaim, and Yoram Weiss. 1993. "Social Status, Culture and Economic Performance." *Economic Journal* 103: 946-959.

Freedom House. 2009. *Freedom in the World*. Washington: Freedom House.

Gintis, Herbert. 2003. "Solving the Puzzle of Prosociality." *Rationality and Society* 15(2): 155-187.

Goeree, Jacob K., Thomas R. Palfrey, Brian W. Rogers, Richard D. McKelvey. 2007. “Self-Correcting Information Cascades.” *Review of Economic Studies* 74(3): 733-762.

Goldstone, Jack A. 1994. "Is Revolution Individually Rational?" *Rationality and Society* 6(1): 139-166.

————. 2001. "Toward a Fourth Generation of Revolutionary Theory." *Annual Review of Political Science* 4: 139-187.

Gould, Roger V. 1993. "Collective Action and Network Structure." *American Sociological Review* 58(2): 182-196.

Granovetter, Mark. 1978. "Threshold Models of Collective Behavior." *American Journal of Sociology* 83(6): 1420-1443.

Greif, Avner 2005. "Commitment, Coercion, and Markets: The Nature and Dynamics of Institutions Supporting Exchange", in (C. Menard and M.M. Shirley, eds.), *Handbook for New Institutional Economics*, Norwell, MA: Kluwer Academic Publishers.

————. 2006. *Institutions and the Path to the Modern Economy: Lessons from Medieval Trade*. Cambridge: Cambridge University Press.

————. 2010. "A Theory of Moral Authority: Moral Choices under Moral Networks Externalities." Mimeo, Stanford University.

Greif, Avner, and Steven Tadelis. 2010. "A Theory of Moral Persistence: Crypto-morality and Political Legitimacy." *Journal of Comparative Economics*: 38(3): 229-244.

Iannaccone, Laurence R. 1988. "A Formal Model of Church and Sect." *American Journal of Sociology* 94(Supplement): S241-S268.

International Monetary Fund. (Various). *Annual Report*. Washington: IMF.

Iyigun, Murat. 2009. "Monotheism (From a Sociopolitical & Economic Perspective)." Working Paper.

Karaman, Kamil Kivanç. 2009. "Decentralized coercion and self-restraint in provincial taxation: The Ottoman Empire, 15th–16th centuries." *Journal of Economic Behavior & Organization* 71(3): 690-703.

Kim, Hyojoung and Peter S. Bearman. 1997. "The Structure and Dynamics of Movement Participation." *American Sociological Review* 62(1): 70-93.

Klein, Naomi. 2007. *Shock Doctrine: The Rise of Disaster Capitalism*. New York: Holt and Company.

Kohlscheen, Emanuel. 2010. "Sovereign risk: constitutions rule." *Oxford Economic Papers* 62(1): 62-85.

Kübler, Dorothea and Georg Weizsäcker. 2004. "Limited Depth of Reasoning and Failure of Cascade Formation in the Laboratory." *Review of Economic Studies* 71(2): 425-441.

————. 2005. "Are Longer Cascades More Stable?" *Journal of the European Economic Association* 3(2/3): 330-339.

Kuhn, Michael G., and Jorge P. Guzmàn. 1990. *Multilateral Official Debt Rescheduling: Recent Experience*. Washington: IMF.

Kuran, Timur. 1987. "Preference Falsification, Policy Continuity and Collective Conservatism." *Economic Journal* 97: 642-665.

————. 1989. "Sparks and prairie fires: A theory of unanticipated political revolution." *Public Choice* 61: 41-71.

————. 1991. "Now Out of Never: The Element of Surprise in the East European Revolution of 1989." *World Politics* 44(1): 7-48.

————. 1995a. *Private Truths, Public Lies: The Social Consequences of Preference Falsification*. Cambridge: Harvard University Press.

————. 1995b. "The Inevitability of Future Revolutionary Surprises." *American Journal of Sociology* 100(6): 1528-1551.

————. 1998. "Ethnic Norms and Their Transformation through Reputational Cascades." *Journal of Legal Studies* 27(2): 623-659.

———. 2005. "The Absence of the Corporation in Islamic Law: Origins and Persistence." *The American Journal of Comparative Law* 53: 785-834.

Kuran, Timur, and William H. Sandholm. 2008. "Cultural Integration and Its Discontents." *Review of Economic Studies* 75: 201-228.

Kuran, Timur, and Cass R. Sunstein. 1999. "Availability Cascades and Risk Regulations." *Stanford Law Review* 51(4): 683-768.

Lockwood, Ben. 2002. "Distributive Politics and the Costs of Centralization." *Review of Economic Studies* 69: 313-337.

Lohmann, Susanne. 1994. "The Dynamics of Informational Cascades: The Monday Demonstrations in Leipzig, East Germany, 1989-91." *World Politics* 47(1): 42-101.

Macy, Michael W. 1991. "Chains of Cooperation: Threshold Effects in Collective Action." *American Sociological Review* 56(6): 730-747.

Manor, James. 1999. *The political economy of democratic decentralization*. Washington DC: World Bank.

Marshall, Monty G. and Keith Jaggers. 2008. *Polity IV project: Political regime characteristics and transitions, 1800-2008*.

Marwell, Gerald, Pamela E. Oliver, and Ralph Prahl. 1988. "Social Networks and Collective Action: A Theory of the Critical Mass. III." *American Journal of Sociology* 94: 502-534.

Meng, Xin, Nancy Qian, and Pierre Yared. 2010. "The Institutional Causes of China's Great Famine, 1959-61." NBER Working Paper 16361.

Naylor, Robin. 1990. "A Social Custom Model of Political Action." *European Journal of Political Economy* 6(2): 201-216.

Oliver, Pamela E. 1993. "Formal Models of Collective Action." *Annual Review of Sociology* 19: 271-300.

Oliver, Pamela E. and Gerald Marwell. 1988. "The Paradox of Group Size in Collective Action: A Theory of the Critical Mass. II." *American Sociological Review* 53: 1-8.

Oliver, Pamela E., Gerald Marwell, and Ruy Tiexeira. 1985. "A Theory of the Critical Mass. I. Interdependence, Group Heterogeneity, and the Production of Collective Action." *American Journal of Sociology* 91(3): 522-556.

Olsson-Yaouzis, Nicolas. 2012. “An evolutionary dynamic of revolutions.” *Public Choice* 151(3-4): 497-515.

Olson, Mancur. 1963. "Rapid Growth as a Destabilizing Force." *Journal of Economic History* 23(4): 529-552.

———. 1971. *The Logic of Collective Action: Public Goods and the Theory of Groups*. Cambridge: Harvard University Press.

Rasler, Karen. 1996. "Concessions, Repression, and Political Protest in the Iranian Revolution." *American Sociological Review* 61(1): 132-152.

Rijckeghem, Caroline van and Beatrice Weder. 2009. “Political institutions and debt crises.” *Public Choice* 138: 387-408.

Romer, David. 1984. "The Theory of Social Custom: A Modification and Some Extensions." *Quarterly Journal of Economics* 99(4): 717-727.

Rondinelli, Dennis. 1981. “Government Decentralization in Comparative Perspective: Theory and Practice in Developing Countries.” *International Review of Administrative Science* 47(2).

Rubin, Jared. 2011. "Institutions, the Rise of Commerce, and the Persistence of Laws: Interest Restrictions in Islam & Christianity." *Economic Journal* 121(557): 1310-1339.

———. 2012. "Printing and Protestants: An Empirical Test of the Role of Printing in the Reformation." Working Paper.

Siegel, David A. 2009. “Social Networks and Collective Action.” *American Journal of Political Science* 53(1): 122-138.

Shugart, Matthew Soberg. 1989. "Patterns of revolution." *Theory and Society* 18: 249-271.

Slater, Dan. 2009. “Revolutions, Crackdowns, and Quiescence: Communal Elites and Democratic Mobilization in Southeast Asia.” *American Journal of Sociology* 115(1): 203-254.

Tanter, Raymond, and Manus Midlarsky. 1967. "A theory of revolution." *Journal of Conflict Resolution* 11(3): 264-280.

Tullock, Gordon. 1971. "The Paradox of Revolution." *Public Choice* 1: 89-99.

Walton, John and Charles Ragin. 1990. “Global and National Sources of Political Protest: Third World Responses to Debt Crisis.” *American Sociological Review* 55(6): 876-890.

Walton, John and David Seddon. 1994. *Free Markets & Food Riots*. Cambridge, MA: Blackwell.

Watts, Duncan J. and Peter Sheridan Dodds. 2007. "Influentials, Networks, and Public Opinion Formation." *Journal of Consumer Research* 34(4): 441-458.

World Bank. (Various). *World Development Indicators*. Washington: World Bank.

————. (Various). *World Tables*. Baltimore: Johns Hopkins University Press.

Yin, Chien-Chung. 1998. "Equilibria of Collective Action in Different Distributions of Protest Thresholds." *Public Choice* 97: 535-567.